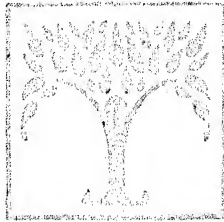


# THE COMPACT ENCYCLOPEDIA

VOLUME I

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## Plates

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# THE COMPACT ENCYCLOPEDIA

## VOLUME I

**Engraving.** Impressions from metal plates are called engravings, prints, or plates; those printed from wood being termed indifferently wood engravings or wood-cuts. As a rule, in prints from metal the lines intended to print are incised, and in order to take an impression the plate is daubed over with a thick ink which fills all the lines. The surface is then wiped perfectly clean, leaving only the incised lines filled with ink. A piece of damp paper is then laid on the face of the plate, and both are passed through the press, which causes the ink to pass from the plate to the paper. This operation needs to be repeated for every impression. In the wood block, on the contrary, the spaces between the lines of the drawing are cut out, leaving the lines standing up like type, the printing being from the inked surface of the raised lines, and effected much more rapidly than plate printing.

Engraving on wood, intended for printing or impressing from, long preceded engraving on metals. The art is of Eastern origin, and at least as early as the tenth century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans for impressing patterns on textiles, but no paper impressions earlier than the fourteenth century are known. For a hundred years there is small indication of the practice of the art, which was at first confined to the production of block-books, playing-cards, and religious prints. According to

Vasari, the art of printing from metal plates was discovered in Florence by Finiguerra about 1460. The work Florentine engravers, however, was at once surpassed in Venice and elsewhere in North Italy by Andrea Mantegna (1506), Girolamo Mocetto, Jacopo de'bari, and others. In Marc Antoni mondi (1475-1534), who wrought the guidance of Raphael, and reproduced many of his works, the art reached the highest point of the earlier period. In Germany, Albert Dürer (1471-1528) excelled both in copper and wood engraving, especially in the latter. The Dutch Flemish schools, of which Dürer's contemporary Lucas van Leyden was the most famous, did much to enlarge the scope of the art. Peter Paul Rubens (1577-1640) influenced engraving through the two Bolswerts, Vorsterman, Pontius, and P. de Jode, who engraved many of his works on a large size. Towards the end of the seventeenth century engraving, which had before been rarely used, became more common, and was practised to a supreme mastery by Rembrandt (1639-1669) and other painters of that period. In France, Noel Garnier founded a school of engraving about the middle of the eighteenth century; but it produced none of any high distinction until the reign of Louis XIV, when Robert Nanteuil, a follower of Gerard Edelinck, and Antoine Masson produced many fine portraits. In England, Gerard Audran engraved works for Louis XIV, and Gerard Poussin and Le Brun. Jacques Callot also produced some admirable engravings. These were followed about the middle

of the eighteenth century by Wille (1717-1807). The first English engraver of marked importance was William Hogarth (1697-1764). In historical engraving a not less remarkable advance was made by Sir Robert Strange (1721-1792); and Richard Earlom (1743-1822), Valentine Green, and J. R. Smith produced some admirable works in mezzotint. In succession to these came William Sharp (1746-1824), James Bazire (1780-1802), Bartolozzi (1727-1815), who practised stipple engraving, James Heath, Bromley, Raimbach, and others. The substitution of steel for copper plates (1820-1830) gave the power of producing a much larger number of fine impressions, and opened new possibilities for highly finished work. In the period 1820-1860 landscape engraving attained a perfection in Great Britain which it had not attained in any other country, or at any other time. Among landscape engravers the names of William Miller (1796-1882), E. Goodall (1795-1870), J. Cousen (1804-1880), and Wm. Forrest (born 1805) hold the foremost places. Most of these were associated with the reproduction of Turner's pictures, and owed much to his control and direction. In mezzotint engraving Samuel Cousins (1801-1887) and David Lucas, who was associated with John Constable in the 'English Landscape' series, achieved considerable success. Since 1870 many reproductions of paintings have been produced by means of etching (q.v.).

*Stipple*, or *Chalk Engraving*, in its pure state, is exclusively composed of dots, made with a special form of graver, varying in size and form as the nature of the subject demands, but few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. Etching is often used to put in the more important lines and tone masses. The *Mixed Style* is based on mezzotint, which, still forming the great mass of shading, is in this method combined with etching in the darker, and stipple in the more delicate parts. By this combination a plate will produce a larger number of good impressions than it would if it were done entirely in mezzotint. See *Aquatint*; *Etching*; *Mezzotint*.

*Engraving on Wood*.—The wood best adapted for engraving is box. It is cut across the grain in thickness equal to the height of type, these slices being subjected

to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block, the unshaded parts being cut away, and the lines giving form, shading, texture, &c., left standing in relief by excavations of varied size and character, made between them by gravers of different forms. Drawings on wood are made either with black-lead pencil alone or with pencil and indian ink, the latter being employed for the broader and darker masses. It is now much the practice to photograph drawings made in black and white upon the wood instead of making the drawing on the wood block. When the drawing is put on the wood by washes or by photography, instead of being entirely done by pencil lines, the engraver has to devise the width and style of lines to be employed instead of cutting in facsimile, as is the case when the drawing is made entirely in lines. The tools required for wood engraving are similar but more numerous than those of the engraver on copper or steel.—BIBLIOGRAPHY: W. Y. Ottley, *Early History of Engraving*; A. M. Hind, *A Short History of Engraving and Etching*; J. H. Slater, *Engravings and their Value*.

**Engrossing, Forestalling, and Regrating.** The offence of *engrossing* was described as the "getting into one's possession, or buying up, large quantities of corn, or other dead victuals, with intent to sell them again"; *forestalling*, as the "buying or contracting for any cattle, merchandise, or victual, coming in the way to the market, or dissuading persons from bringing their goods or provisions there, or persuading them to enhance the price when there"; and *regrating*, "the buying of corn or other dead victual in any market and selling it again in the same market, or within 4 miles of the place". By the statute of Edward VI the engrossing of corn was made punishable by imprisonment and pillory. All the positive statutes against these offences were repealed in 1772.

**Enid**, a city of Oklahoma, U.S.A. It has a university and many fine buildings. There are flour-mills, lumber-mills, and engineering shops, and a large trade in agricultural produce. Pop. 16,576.

**Enkeldoorn**, a town, Southern Rhodesia, 170 miles north-east of Bulawayo, is the centre of a district mainly colonized by

Dutch farmers. Tobacco is grown, and there are several ostrich-farms.

**Enkhuizen**, a seaport of Holland, on a projection in the Zuider Zee, 29 miles north-east of Amsterdam. It had formerly a pop. of 40,000, but the silting up of the harbour has caused its decay, and its inhabitants now number about 7110.

**Ennis**, a town, County Clare, Irish Free State, on the Fergus. Some linen and flannel are manufactured, and there is a trade in agricultural produce. Pop. (1926) 5517.

**Enniskillen**, a town, County Fermanagh, Northern Ireland, on an island in the river between the upper and lower sections of Lough Erne, connected with the mainland by two bridges. Pop. (1926) 4883.

**Ennius**, Quintus (239-170 B.C.), the father of Latin poetry. Little is known of his life; he served in the Second Punic War, and held the rank of centurion in 204 B.C.; at a later date he went to Rome and supported himself by teaching. Ennius was a man of great versatility, and wrote comedies, tragedies, epics, and didactic poetry. His chief fame, however, rests upon his *Annales*, a great epic in eighteen books. Like all of the works of Ennius, it only survives in fragments quoted by later writers. In his epitaph Ennius boasted that he still lived as he passed to and fro through the mouths of men (*colito vivu' per ora virum*). Though his works are lost, this is still true, for he inspired Virgil and influenced all Latin literature.—Cf. Miss E. M. Stuart, *The Annals of Ennius*.

**Enns**, a river in Austria, which rises in the Alps of Salzburg, flows through Upper Austria, and enters the Danube a little below the town of Enns. Total course, about 150 miles.

**Enoch**, Book of, an apocryphal book of unknown authorship, but probably written by a Palestinian Jew in Hebrew or Aramaic, and translated into Greek; from the Greek the existing Ethiopic version was made in the first or second century B.C. The book was lost until 1773, when Bruce, the African traveller, discovered the Ethiopic text in Abyssinia.

**Enos**, a seaport in Thrace, 38 miles north-west of Gallipoli, on the Ægean Sea, in the Gulf of Enos. It trades in wax, wool, cotton, &c. Pop. 8000, mostly Greeks.

**Enschede**, a town of Holland, province of Overijssel, near the Prussian frontier,

the chief seat of cotton manufacture Holland. Pop. 43,069.

**Ensenada**, a seaport of the Arg Republic, province of Buenos Aires, port of the town of La Plata, with reconstructed harbour works.

**Ensign**, formerly, in the British, the officer who carried the flag or colour of an infantry regiment; for this second lieutenant has been substituted since 1871.

**Ensilage**, in agriculture, a method of storing green fodder or vegetables in stacks called 'silos'. These are usually pits of quadrangular form, lined with wood, brick, concrete, or stone. The fodder is cut and mixed, placed in the silo, pressed down, and kept compressed by heavy weights placed on a wooden covering. It undergoes a fermentation, and attains a slightly sour taste and smell, which is particularly objectionable to cattle. The modern system of ensilage dates from about 1875.

**Entada**, a genus of leguminous plants, sub-order Mimoseae, containing about a dozen species of climbing tropical shrubs, remarkable for the great size of their seed pods.

**Entail**, in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with particular restrictions as to the donor's heirs.

**Entebbe**, the administrative capital of Uganda Protectorate. It is situated on Lake Victoria, and has good steamship communications with other lake harbours.

**Entellus**, an East Indian species of monkey, of the genus *Semnopithecus* (*entellus*). It has yellowish fur, with a tinge of violet, and a long and powerful tail, which, however, is not prehensile. It receives divine honours from the natives of India, by whom it is termed *Hanum*.

**Entente Cordiale**, a term applied to international politics to friendly relations existing between different countries or statesmen. It is not a formal alliance, but denotes the existing community of interests and friendly sentiments between two countries. The term has been especially applied to the friendly relations which existed between France and England since the reign of Edward VII down to the formal alliance concluded at the outbreak of the European War. The phrase is found in a letter written by Queen

Victoria to the King of the French, 17th Oct., 1844.

**Enteric Fever.** See *Typhoid Fever*.

**Enteritis** is inflammation of the intestines. It varies from a mild intestinal catarrh, causing slight symptoms, and yielding to treatment in a few days, to cases of severe vomiting and diarrhoea with extreme prostration. These severe forms are most frequently seen in infants and young children during the summer months, and frequently prove fatal. Removal of the cause of irritation and complete rest to the intestines are to be aimed at, as far as possible, in the treatment of the condition.

**Entertainments Tax**, first imposed by the Finance (New Duties) Act, 1916, is an *ad valorem* duty on payments for admission of persons as spectators or members of an audience to any entertainment. Entertainment is defined as including any exhibition, performance, amusement, game, or sport to which persons are admitted for payment. The tax is collected by means of stamped tickets of admission, or (in respect of places of regular entertainment, and in other cases on special cause shown) on the basis of returns furnished to the Board of Customs and Excise by arrangement previously made with the Board. Admission by complimentary ticket is not taxable if no indirect payment is a condition of such admission. Entertainments for educational or charitable purposes are, under certain conditions, exempt. The tax is graded, from  $\frac{1}{2}d.$  on seats costing less than  $2\frac{1}{2}d.$ , up to  $3d.$  for the first  $1s. 3d.$ , and  $1d.$  for every additional  $5d.$  or part thereof.

The amount yielded by the tax for the fiscal year 1916-1917 was over £3,000,000, for 1917-1918 nearly £5,000,000, while for 1930-1931 it was approximately \$6,952,088.

**Entomology**, the branch of zoology which treats of insects. The true insects are those animals of the phylum Arthropoda distinguished from the other classes of the phylum by the fact that the three divisions of the body—the head, thorax, and abdomen—are always distinct from one another. There are never more than three pairs of legs in the perfect insect, and these are all borne upon the thorax. Each leg consists of from six to nine joints. Normally two pairs of wings are present, but one or other, or both, may

be wanting. In the beetles the anterior pair of wings is called in this condition 'elytra' or 'wing-cases'. Respiration is effected by means of air-tubes or trachea. The head is composed of several segments amalgamated together, and carries a pair of feelers or 'antennæ', a pair of eyes, usually compound (and often simple eyes in addition), and the appendages of the mouth. The abdominal segments are usually more or less freely movable upon one another, and never carry locomotive

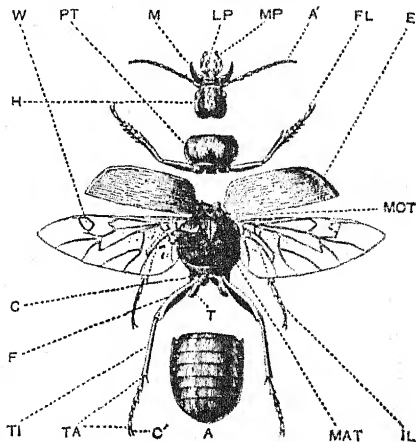
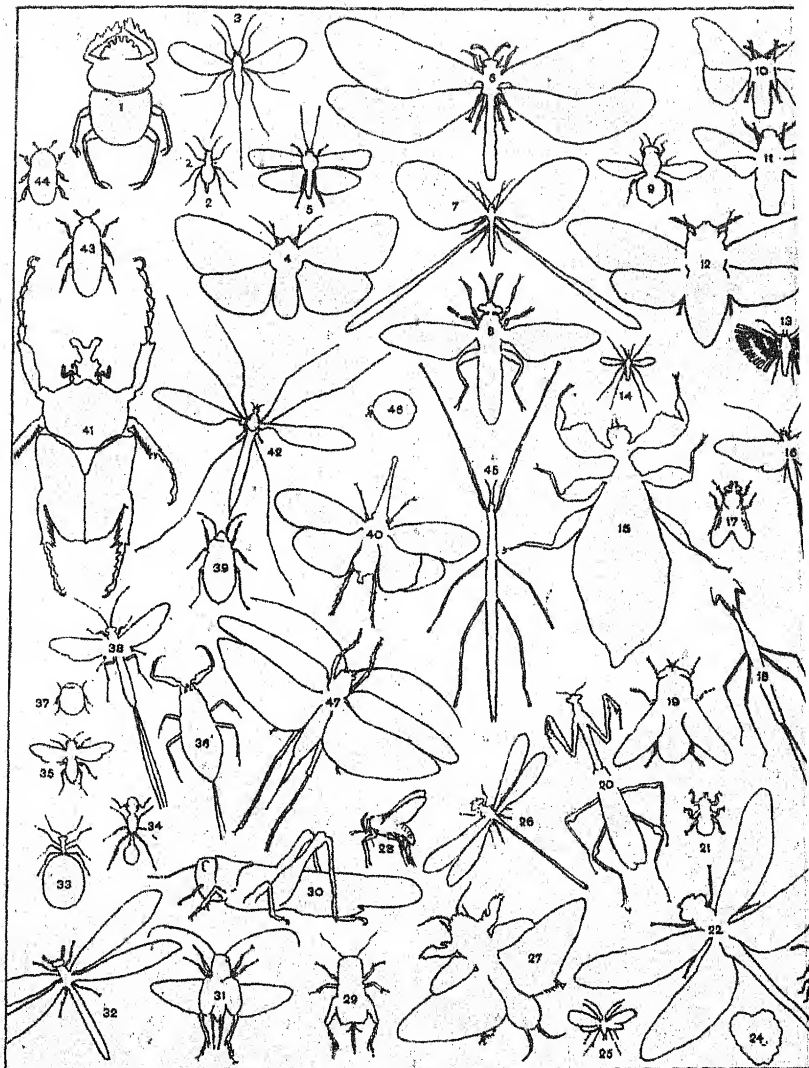


Diagram showing Parts of a Beetle

W, Wing. PT, Prothorax. M, Mandible. LP, Labial palpi. MP, Maxillary Palpi. A', Antenna. FL, Foreleg. E, Elytron. H, Head. MOT, Mesothorax. C, Coxa. F, Femur. TI, Tibia. TA, Tarsi. C', Claws. A, Abdomen. MAT, Metathorax. IL, Intermediate leg. T, Trochanter.

limbs; but the extremity is frequently furnished with appendages connected with generation, which in some cases serve as offensive and defensive weapons (stings). The alimentary canal consists of the oesophagus or gullet, a crop, a gizzard, a stomach, and an intestine, terminating in a cloaca. There is no regular system of blood-vessels; the most important organ of the circulation is a contractile vessel situated dorsally and called the 'dorsal vessel'. The nervous system consists of a pair of cerebral ganglia (brain) in the head, these being the thickened upper part of a nerve-ring which encircles the gullet and passes below into a double



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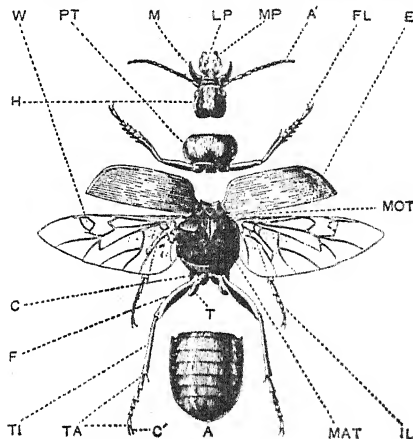


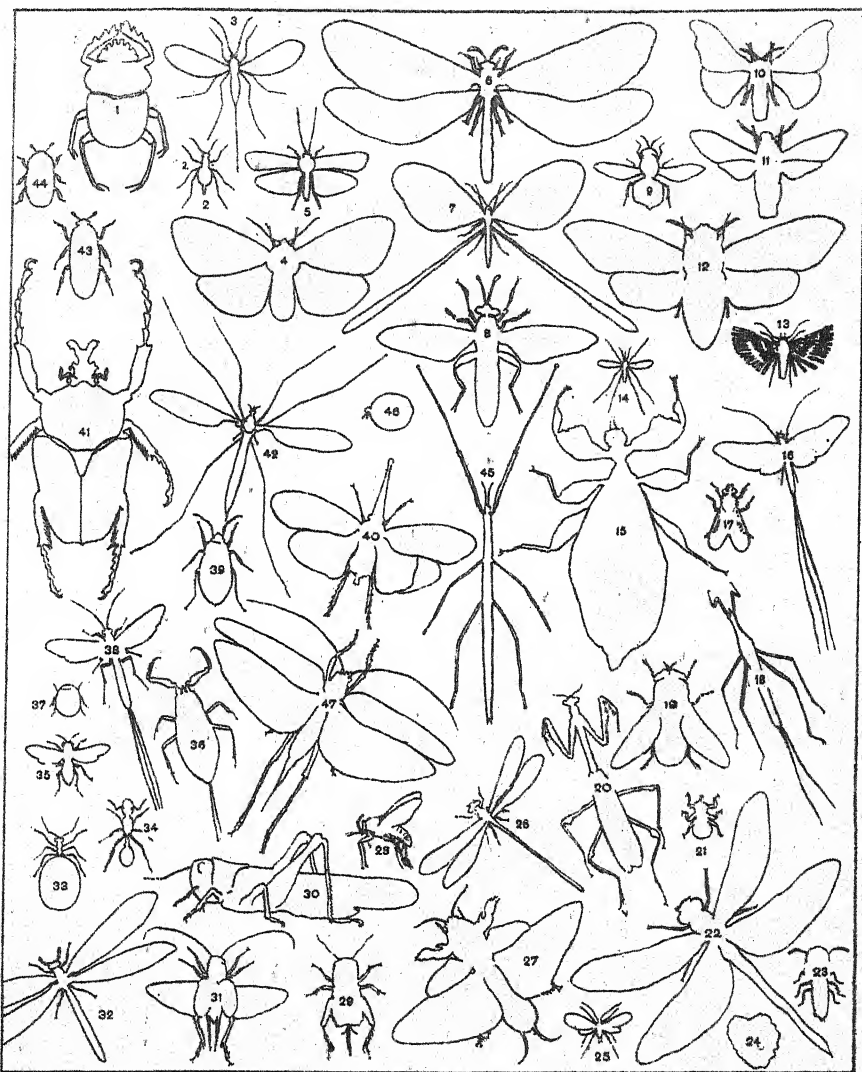
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# ENTOMOLOGY



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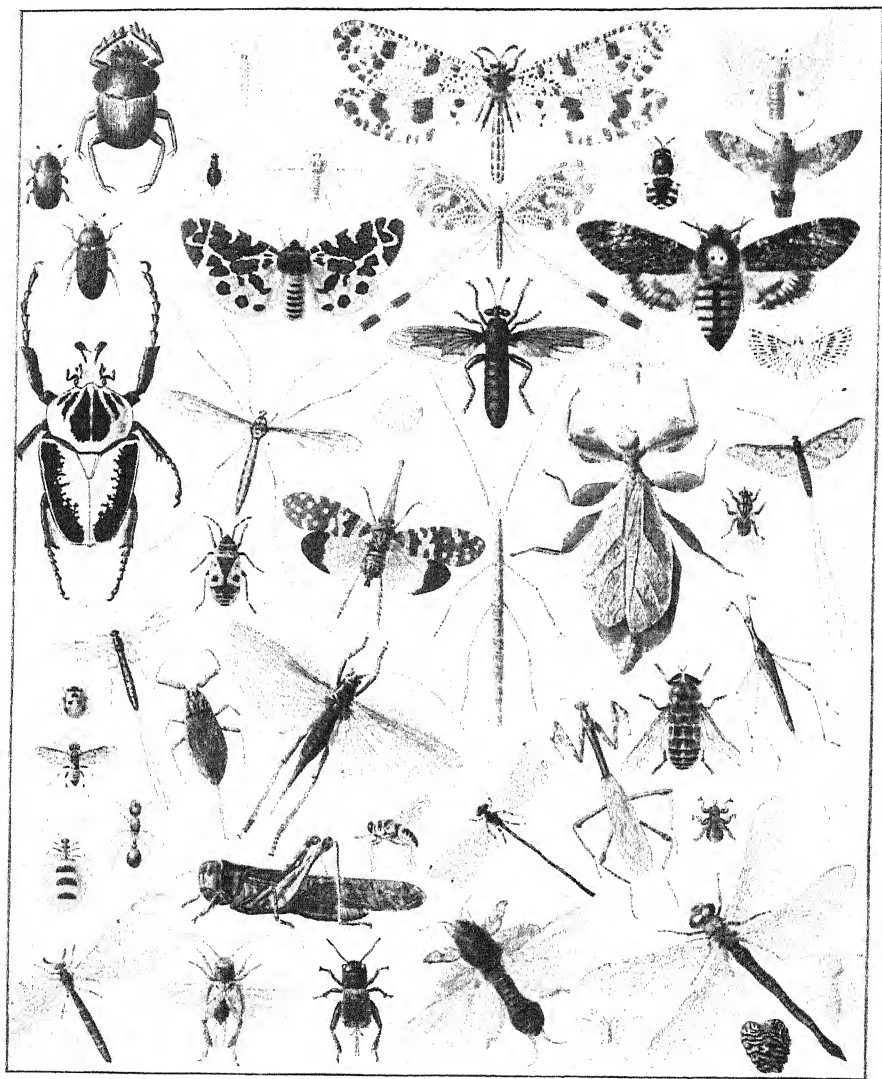
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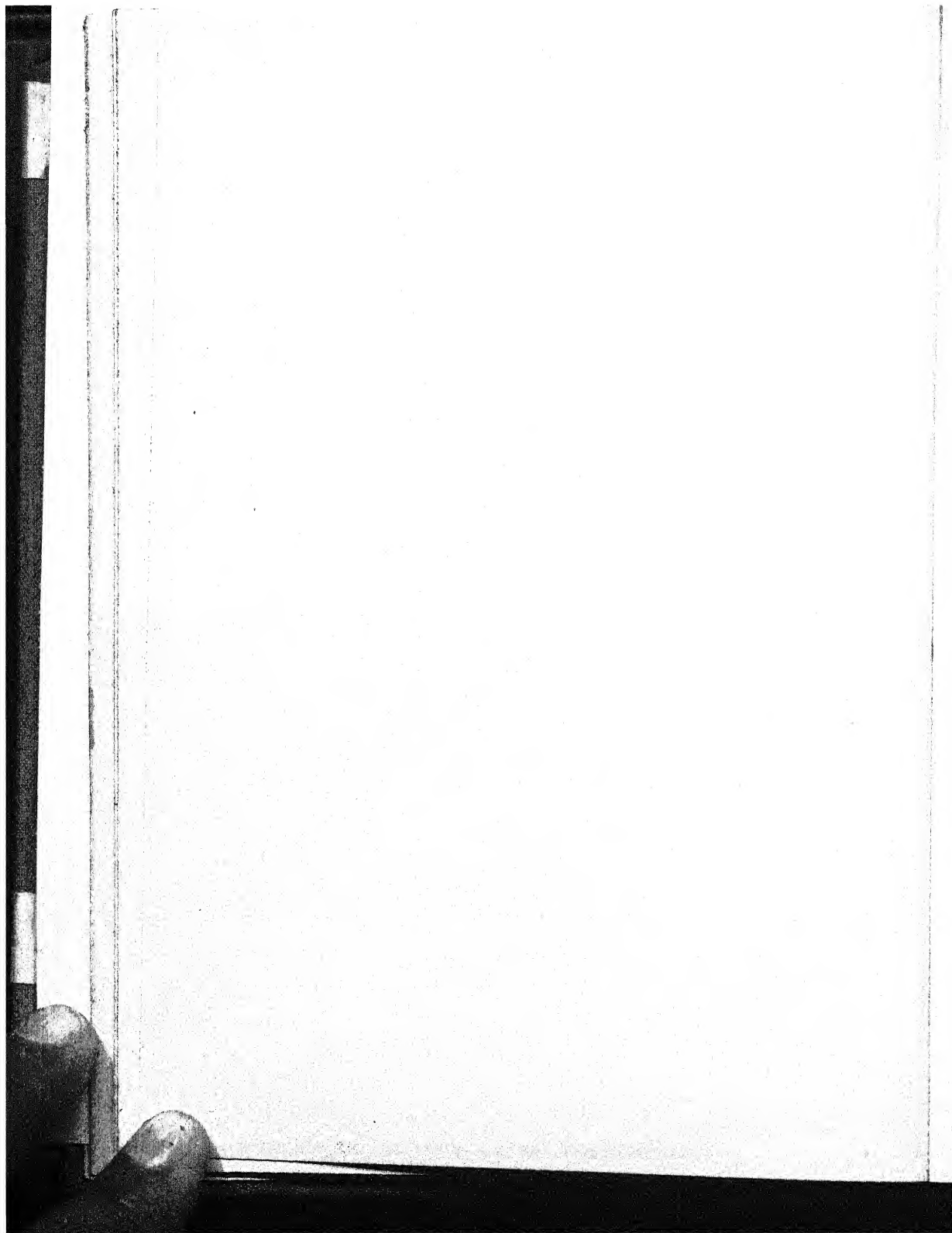
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ENTOMOLOGY



See key on covering tissue



ventral nerve-cord dilated into ganglia at intervals. The sexes are in different individuals, and most insects are oviparous. Reproduction is generally sexual, but non-sexual reproduction also occurs (see *Parthenogenesis*). Generally the young are very different from the full-grown insect, and pass through a 'metamorphosis' before attaining the mature stage. The principal orders are: Aptera (tassel-tails and spring-tails), Hemiptera (cicadas, bugs, plant-lice), Orthoptera (cockroaches, crickets, grasshoppers, locusts, earwigs), Neuroptera (dragon-flies, may-flies, white ants), Diptera (gnats, bot-flies, gad-flies, mosquitoes, house-flies, fleas), Lepidoptera (butterflies and moths), Hymenoptera (bees, wasps, and ants), and Coleoptera (lady-birds, glow-worms, cockchafers, weevils, and the beetles).

**Entomophaga** ('insect eaters'), a term applied to (1) a group of hymenopterous insects whose larvæ feed upon living insects; (2) a tribe of marsupials, as the opossums, bandicoots, &c., which are insectivorous, though not exclusively so; (3) a section of the edentates, as the anteater and pangolin.

**Entomophthorineæ**, a curious family of Fungi, group Zygomycetes, all parasites on insects. The best known is *Empusa Muscæ*, which attacks the common house-fly. It has been proposed to utilize this fungus in combating the fly nuisance.

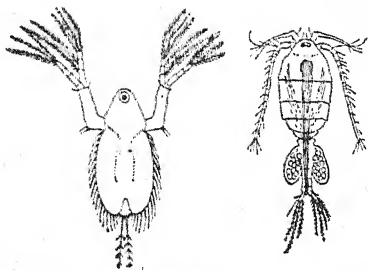
**Entomostraca**, a sub-class of crustacea, including forms which are mostly small, and comprising four orders: (1) Branchiopoda, brine-shrimps and water-fleas; (2)

lation (plankton); (3) Cirripedia, barnacles; (4) Ostracoda, types such as Cypris enclosed in a bivalve shell.

**Entozoa**, a general name for the various parasitic worms that infest the bodies of other animals. Some are found in the intestines, others in the liver, brain, muscles, and other tissues. They pass through different stages in their development, and at each stage may occupy a different organ (or tissue), and usually a different animal. Thus the cystic or bladder-worm, whose presence in the brain of sheep causes staggers, is the immature form of a tape-worm of the dog, &c.

**Entre Minho-e-Douro**, a province of Portugal, lying between the Rivers Minho and Douro. Area, 2790 sq. miles; pop. 1,304,461. The chief products are grain, wine, oil, and flax. Oporto, the capital, has a good trade in wine. On the coast fisheries are important.

**Entrenchments.** The following are the salient features in the design of modern entrenchments: (1) A parapet 18 inches high, and upwards of 5 feet thick, in front of every fire-trench. (2) Longitudinal division of every trench, either by projecting buttresses of earth or by bends, so that no straight portion exceeds 10 yards in length. The effect of this is to give protection against flanking or enfilade rifle-fire, and to localize the burst of shell. (3) A parapet on the rear side (parados), to shield the defenders from the back-blast of shell which burst beyond the trench. (4) Wide trenches (6 feet at the top), to minimize the risk of men getting buried during bombardment. (5) Accommodation, in dug-outs and other refuges, for a proportion of the troops. Modern entrenchments are arranged in depth. The 'lines' of Wellington's time have given place to a broad belt of mutually supporting defences, organized in three zones. These merge imperceptibly into one another, and each zone extends upwards of a mile from front to rear. The foremost fringe of the outpost zone is in contact with the enemy. It takes the first shock of a hostile attack. The battle zone is more elaborately organized, and capable of being very heavily manned. Lying still farther back is the third zone, which serves for the accommodation of reserves of troops, and is also prepared for defence, as a last resort, in case the enemy should penetrate the battle zone.



Spiny-tailed Water-flea (*Daphnia*) on left;  
Cyclops on right. Both enlarged.

Copepoda, including the freshwater Cyclops, and numerous marine species contributing to the floating surface popu-

**Entre Rios**, a province of the Argentine Republic, lying between the Uruguay and the Parana; area estimated at 29,241 sq. miles; pop. 475,236. The province is largely pastoral, though lime, gypsum and other minerals are worked. The capital is Parana.

**Entropy**, a term introduced into physics by Clausius as the name of one of the two important thermodynamical properties of a substance—the other being the *energy*—which depend on its 'state'. The meaning of the term may be illustrated by taking a simple case. Suppose we have 1 lb. of water at atmospheric pressure and 212° F., say, and suppose we apply heat to the water and change it into 1 lb. of steam at 212° F. The temperature does not change during this process, while the heat which must be added is the latent heat of the steam, namely, about 960 British Thermal Units. The increase of entropy from the first state to the second state is got by dividing the heat given to the substance, namely, 960 B.Th.U., by the absolute temperature at which that heat was given to the substance, namely,  $461 + 212 = 673$  degrees absolute, i.e. the increase of entropy is  $\frac{960}{673} = 1.43$  units. See *Thermodynamics*.

**Enver Pasha** (1881-1922), Turkish soldier and politician. After being Minister of War, Enver subsequently became one of the leaders of the Committee of Union and Progress. A staunch pro-German, he was to a great extent responsible for Turkey's entry into the European War as an ally of Germany. After the Armistice of 1918, Enver Pasha fled to the Caucasus.

**Environment**, in biology, the surroundings of an organism, including non-living factors, such as climate and weather; and also other organisms. Plants and animals are more or less adapted to their surroundings, a good example being the mutual adaptations of flowers and insects, but there has been much controversy as to the way in which such adaptations have come about. Among all but unicellular organisms any individual consists of (1) a general body (*soma*), by which the life of the individual is maintained, and (2) germ-cells, capable of becoming fresh individuals, and thus providing for the continuance of the species. According to a school of thought founded by some of the pre-Darwinian evolutionists, notably

Buffon, Lamarck, and Treviranus, modifications of the soma (acquired characters) of an individual, brought about by the action of the environment (e.g. thickening of parts of the skin as the result of constant pressure), or by use and disuse (e.g. increased size of muscles; diminished wings of poultry), can be inherited, leading to increasing alteration capable of ending in the production of new species. Most living biologists, however, hold with Weismann that only *germinal variations*, i.e. variations in the substances of the germ-cells are heritable. The whole subject is one of more than academic interest, especially in regard to the further evolution of human beings. So far as we know at present, there is little reason to think that the children of parents possessing undesirable acquired characters are unduly handicapped from the very start. We must, of course, exclude cases of antenatal infection by the microbes of certain infectious or contagious diseases to which one or both parents have fallen victims, and also those of direct poisoning of germ-cells as the result of alcoholism. See *Hereditarity*.

**Enzeli**, a port of Persia, on the Caspian Sea, 16 miles north-west of Resht.

**Enzymes**. See *Fermentation*.

**Eocene**, in geology, a term applied to the lowest division of the Tertiary strata. The Eocene beds are arranged in two groups, termed the Lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene. They consist of marls, limestones, clays, and sandstones, and are found in the Isle of Wight and in the south-east of England and north-west of France, in Central Europe, Western Asia, Northern Africa, and the Atlantic coast of North America.

**Eon de Beaumont**. See *D'Eon de Beaumont*.

**Eötvös**, Baron Joseph (1813-1871), Hungarian statesman and author. He was appointed Minister of Public Instruction in 1867, and filled this office until his death. Among his works are the novels: *The Carthusian*, *The Village Notary*, and *Hungary in 1514*—giving vivid pictures of Hungarian life.

**Eozoon**, a supposed gigantic fossil foraminifer found in the limestone of the pre-Cambrian rocks of Canada. The structure, however, which is recognized also in Bavaria and in County Galway, occurs in

limestone associated with the volcanic focus of Vesuvius.

**Epacris**, a genus of gamopetalous Dicotyledons, the typical genus of the nat. ord. Epacridaceæ. The species are shrubby plants, with axillary, white, red, or purple flowers, generally in leafy spikes. The British species, *E. grandiflora*, has flowers nearly an inch in length, of a brilliant reddish-purple at the base and pure white at the apex. The order Epacridaceæ consists of plants allied to the heaths, chiefly natives of Australia.

**Epaminondas** (c. 418 B.C.—362 B.C.), Greek statesman and general. He took the leading part in the struggle during which Spartan supremacy in Greece was destroyed, and the supremacy of Thebes temporarily secured. Four times he successfully invaded the Peloponnesus at the head of the Thebans, but after his death at the battle of Mantinea, Thebes soon sank to her former secondary condition.

**Épée**, Charles Michel, Abbé de l' (1712–1789), French philanthropist. The great object of his life was the instruction of the deaf and dumb, upon whom he spent his whole income, founding an institution for them in 1770.

a handsomely marked species, which constructs a beautifully symmetrical wheel-shaped web.

**Eperies**, a town of Czechoslovakia, on the Tarcza. It has a large trade in pottery, beer, wine, and linen. There are opal-mines in the vicinity. Pop. 18,000.

**Épernay**, a town of North-Eastern France, department of Marne, on the Marne, the central depot of the wine trade of Champagne. The vast wine-cellars of the town form a labyrinth of galleries cut in the tufa or calcareous soil of the district. Pop. 21,811.

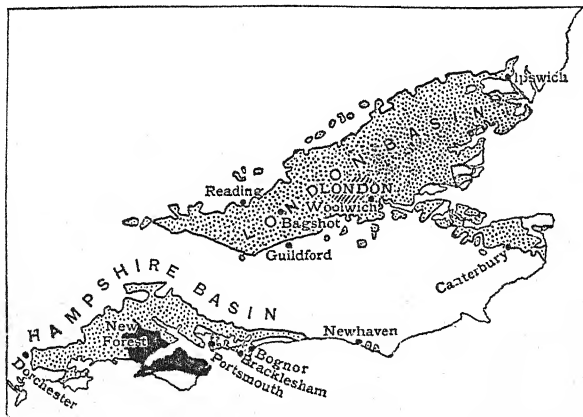
**Ephedra**, the principal genus of the Gnetales family of Gymnosperms. The species are shrubby switch-plants, natives of the warm temperate zone, found especially on sandy soil.

**Ephemera**, the typical genus of the neuropterous insects constituting the family Ephemeridæ. They are known as *may-flies* or *day-flies*. In the state of larvæ and pupæ they are aquatic and exist for years. When ready for their final change, they creep out of the water, beginning to be seen generally in May. They shed their whole skin shortly after leaving the water, propagate their species, and die.

**Ephesians**, **The Epistle to the**, a canonical epistle addressed by the Apostle Paul to the Church which he had founded at Ephesus. It was written during his first captivity at Rome, immediately after he had written the *Epistle to the Colossians* (A.D. 62); and was sent by the hands of Tychicus, who also bore the message to the Church at Colossæ.

**Ephesus**, an ancient Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities. It was at one time the grand emporium of Western Asia, having a convenient and spacious harbour. The Apostle Paul visited Ephesus and established a Christian Church there.

It was famous for its temple of Artemis (Diana), the largest and most perfect model of Ionic architecture, and reckoned one of the seven



Map of Eocene System in England

Eocene strata are dotted. Oligocene strata are in black.

**Epeira**, a genus of spiders, comprising the largest and best-known British species. *E. diadema*, the common garden spider, is



wonders of the world. Several Church councils were held here, especially the Third Ecumenical Council of 431, at which Nestorius was condemned.

Ephors, or Ephori, magistrates of Sparta. They were five in number, were elected annually, and both the judicial authority and the executive power were almost entirely in their hands. Cleomenes III murdered the whole college and abolished the office in 225 B.C.

Ephraem Syrus, that is, 'Ephraim the Syrian' (306-373), writer of the Syrian Church. He wrote several commentaries on Scripture, numerous homilies, and other works.

Epic, a poem of the narrative kind. Epic poetry is distinguished from drama in so far as the author frequently speaks in his own person as narrator; and from lyrical poetry by making the predominant feature the narration of action rather than the expression of emotion. Among the more famous epics of the world's literature may be noted: Homer's *Iliad* and *Odyssey*, Virgil's *Æneid*, the German *Nibelungenlied*, the Anglo-Saxon poem of *Beowulf*, the French *Song of Roland*, Dante's *Divina Commedia*, Tasso's *Jerusalem Liberata*, Ariosto's *Orlando Furioso*, Milton's *Paradise Lost*, Spenser's *Faerie Queene*, Camoens' *Lusiads* (Portuguese), and Firdusi's *Shah Namah* (Persian).—Cf. W. M. Dixon, *English Epic and Heroic Poetry*.

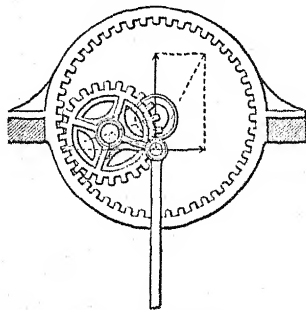
Epicharmus (c. 540-450 B.C.), Greek comic poet. He is credited with the invention of written comedy, and Plato called him "a master of the comic type".

Epictetus (b. A.D. 60), Greek Stoic philosopher. He lived long at Rome, where, in his youth, he was a slave. His doctrines approach more nearly to Christianity than those of any of the earlier Stoics. The excellence of his system was universally acknowledged. His disciple Arrian collected his opinions, which are preserved in two treatises called the *Discourses of Epictetus* and the *Manual* or *Enchiridion*.

Epicurus (342-270 B.C.), Greek philosopher, founder of the Epicurean school. He settled at Athens 306 B.C., where he established a philosophical school. His theory of the universe was based on the atomic theory of Democritus. The fundamental principle of his ethical system was that pleasure and pain are the chief good and evil, the attainment of the one and

the avoidance of the other of which are to be regarded as the end of philosophy. The Latin poem of Lucretius, *De Rerum Natura*, is a poetical exposition of his doctrines. Epicureanism was resuscitated in France by Pierre Gassendi, and its principles have been professed by De la Rochefoucauld, Rousseau, and Voltaire. Epicurus was a very voluminous writer, but few of his writings are extant, what we possess comprising only some fragments of a *Treatise on Nature*, two letters, and detached passages. Lucretius, Cicero, Pliny, and Diogenes Laertius are our chief authorities for his doctrines.—BIBLIOGRAPHY: F. A. Lange, *History of Materialism*; W. Wallace, *Epicureanism*.

Epicycloidal Wheel, a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of



Epicycloidal Wheel

the first, fitted so as to revolve about the centre of the latter. It is used for converting circular into reciprocating motion.

Epidaurus, a seaport of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple of Æsculapius, which stood on an eminence not far from the town. It had a splendid theatre still in fair preservation.

Epidemic, or Epidemic Disease, signifies a disease which attacks a people, suddenly spreading from one to the other in all directions, prevailing a certain time and then dying away. It usually travels from place to place in the direction of the most-frequented lines of communication. The reason is that such diseases are commonly due to some infective material capable of being conveyed from one

individual to another, and of being transported from place to place. In Britain smallpox and cholera are occasionally epidemic, whilst scarlet fever, measles, chicken-pox, diphtheria, typhoid fever, &c., are almost invariably so. Certain diseases which appear to be more mental than physical sometimes occur so numerous as to assume an epidemic form, such as St. Vitus's dance, convulsionary diseases, or suicidal mania.

**Epidermis.** See *Skin*.

**Epidermis**, in botany, the superficial layer of cells covering leaves and young stems. Its principal function is to restrict transpiration, for which purpose its outer wall is more or less cutinized, i.e. chemically modified so as to be very impervious to water and gases, especially the outermost part thereof, the so-called *cuticle*. The epidermis frequently bears hairs of various kinds. Stems which undergo secondary growth in thickness soon cast off their epidermis, its rôle being assumed by cork or bark.

**Epidote**, a mineral of a green or grey colour, vitreous lustre, and partial transparency, a member of the garnet family, occurring in Norway, Siberia, Tyrol, and the United States.

**Epigram**, in a restricted sense, a short poem or piece in verse, which has only one subject, and finishes by a witty or ingenious turn of thought; in a general sense, a pointed or witty and antithetical saying. The two great storehouses of epigrams are the *Greek Anthology* and the works of Martial. Epigrams flourished in modern times after the Revival of Learning. Pope was a great master of the epigram, and the art was practised by Clément Marot, Boileau, Voltaire, Schiller, Goethe, Byron, and Moore, and more recently by Sir William Watson. — **BIBLIOGRAPHY:** H. P. Dodd, *Epigrammatists of Mediæval and Modern Times*; J. G. Lawson, *The World's Best Epigrams*.

**Epigraphy**, a term used both for the study of inscriptions as a whole, and for the science which deals with their classification and decipherment. The most important inscriptions are Egyptian, Cuneiform (Babylonian and Assyrian), Semitic, Greek, Latin, Indian, and Runic. The inscribed writings include epitaphs on the dead, records of important events, dedications of public buildings, with such comparatively private matters as receipts,

contracts, and other business transactions.

**Epilepsy**, a nervous disease, the falling-sickness, so called because the patient falls suddenly to the ground. It depends on various causes, often exceedingly complicated and incapable of being removed; hence it is often an incurable periodical disease, appearing in single paroxysms. In its fully developed form, convulsions, attended by complete unconsciousness, are chief characteristics. Among the different causes may be mentioned intense emotional disturbance in early childhood, injury to the brain or its coverings at birth or subsequently, or some irritation within the skull itself, such as tumours, &c., developing later in life. Epileptiform fits due to the last-mentioned cause differ from those of true epilepsy, and are known as *Jacksonian epilepsy* (cf. Sir W. K. Gowers, *The Borderland of Epilepsy*). It is, for the most part, preceded by a tingling sensation, creeping up from the foot or hand to the breast and head, or some other premonitory symptom such as spectral illusions, headache, giddiness, confusion of thought, sense of fear, &c.; but sometimes there are no precursive symptoms. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself; and this is to be accomplished by raising the head gently and loosening all tight parts of the dress. It is advisable to protect the tongue from being bitten by introducing a piece of india-rubber, cork, or soft wood between the teeth.

**Epilobium**, the willow-herbs, a genus of plants, nat. ord. Onagraceæ, ten species of which are British.

**Epimenides** (sixth century B.C.), Greek philosopher and poet. He is supposed to be the prophet referred to by St. Paul in *Titus*, i, 12.

**Épinal**, a town of Eastern France, capital of the department of the Vosges, on the Moselle. The manufactures consist of articles in metal, cottons, linens, woollens, earthenware, and leather. The famous paper-mills of Archettes are in the vicinity. Pop. 30,000.

**Épinay**, Louise Florence Pétronille, Madame d' (1726–1783), French authoress. In 1748 she became acquainted with Rousseau, and gave him a cottage in which he passed many of his days. She was the author of *Les Conversations d'Émilie*, a companion-volume to Rousseau's *Émile*;



*Lettres à mon Fils; and Mes Moments heureux.*

**Epiphanius**, St. (c. 315–402), a Father of the Church. He combated the opinions of Arius and Origen. His work *Panarion* gives the history, together with the refutation, of a great number of heresies.

**Epiphany**, a festival observed on the 6th of January in honour of the adoration of our Saviour by the three Magi.

**Epiphyte**, a plant which grows on trees, adhering to the bark, as a moss, lichen, fern, &c., but which does not, like a parasite, derive any nourishment from the plant. Most orchids are epiphytes, and so are many Bromeliaceæ and Cactaceæ.

**Epirus**, a country of ancient Greece corresponding to Southern Albania and the north-western division of modern Greece. Pyrrhus was King of Epirus.—Epirus is also the name of an administrative province of Greece, formed after the Balkan campaigns (1912–1913) out of the territory acquired by the country. Pop. 213,784.

**Epistolæ Obscurorum Virorum** (*Letters of Obscure Men*), the title of a collection of satirical letters which appeared in Germany in 1515, and which did much to promote the cause of the Reformation. It was ascribed to Reuchlin, and afterwards to Reuchlin, Erasmus, and Hutten.

**Epitaph**, an inscription upon a tomb or monument in honour or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries.

**Epoch**, or **Era**, is a fixed point of time from which all other years, whether preceding or ensuing, are computed. The Greeks computed their time by periods of four years, called *Olympiads*, from the occurrence every fourth year of the Olympic games. The first Olympiad was in the year 776 B.C. The Romans dated from the supposed era of the foundation of their city (*Ab Urbe Condita*, A.U.C.) in 753 B.C. The *Christian Era*, or mode of computing from the birth of Christ as a starting-point, was first introduced in the sixth century, and was generally adopted by the year 1000. This event is believed

to have taken place earlier, perhaps by four years, than the received date. The *Mahommedan Era*, or *Hegira*, commences on 16th July, 622, and the years are computed by lunar months.

**Epping**, a village of England, in Essex, 17 miles from London, in the midst of an ancient royal forest. The unenclosed portion (5600 acres) was bought by the Corporation of London in 1882, and secured to the public as a free place of recreation. Pop. (1931), 4956.

**Epsom**, a town, Surrey, England, 15 miles south-west of London. The principal attraction now is the grand race-meetings held on the Downs, the chief races being the Derby and Oaks. Pop. (1931), 27,089.

**Epsom Salts**, sulphate of magnesium ( $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ), a cathartic salt which appears in capillary fibres or acicular crystals. It is found covering crevices of rocks, in mineral springs, &c.; but is commonly prepared by artificial processes from magnesium limestone by treating it with sulphuric acid, or by dissolving the mineral *kieserite* ( $\text{MgSO}_4 \cdot \text{H}_2\text{O}$ ) in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salts from the clear solution. It is employed in medicine as a purgative, and in the arts. The name is derived from its having been first procured from the mineral waters at Epsom.

**Epstein**, Jacob (1880– ), Anglo-Russian sculptor, was born in New York and educated in Paris. He settled in England in 1904. His work has been much discussed, and has warm admirers and violent detractors. His work includes Oscar Wilde's tomb at Paris, the decoration of Church Square, Pretoria, the W. H. Hudson memorial in Hyde Park, and a number of portrait busts.

**Equation**, in algebra, a statement that two expressions have the same numerical value. The most important type is that of which the equations  $x^2 + 6x = 7$  and  $x^3 - 6x^2 + 11x - 6 = 0$  are examples. The highest power of  $x$  occurring fixes the *degree* of such an equation. The two equations above are of the *second* and *third* degrees respectively. They are true for certain values only of the unknown  $x$  (viz. 1, -7; 1, 2, 3); these values are called the *roots*. An equation of degree  $n$  has exactly  $n$  roots, but two or more may be equal to each other. To *solve*

an equation is to find its roots. The general equation of degree  $n$  can always be solved to any degree of approximation desired. Graphical methods of solution are often the most satisfactory. The general equation can be solved *algebraically* if  $n$  does not exceed 4, but not for greater values of  $n$ . For  $n = 3$ , the *cubic* equation was first solved by the Italian mathematician Tartaglia, who communicated the solution to Cardan, after binding him to keep it a secret. Cardan, however, gave the solution in his *Algebra*, published at Nürnberg in 1545.

Equations are of great importance in applied mathematics. The data of a problem generally lead to an equation, or a set of equations, among the quantities concerned. In practice a certain number of these quantities are known in any given case; the unknown quantities are then found by the solution of an equation or equations. Non-algebraic equations occur frequently—equations involving trigonometrical functions, for example. For a modern practical method of solving equations of many types, see *Nomography*.

**Equation of Time**, the difference between mean and apparent time, or the difference of time as given by a clock and as given by a sundial, arising chiefly from the varying velocity of the earth in its orbit and the eccentricity of the orbit. The sun and the clock agree four times in the year; the greatest difference between them at the beginning of November is fully sixteen minutes. See *Day*.

**Equator**, that great circle of our globe every point of which is  $90^\circ$  from the poles. All places which are on it have invariably equal days and nights. There is also a corresponding celestial equator, an imaginary great circle in the heavens in the same plane as the terrestrial equator. It is everywhere  $90^\circ$  distant from the celestial poles. During his apparent yearly course the sun is twice in the celestial equator, that is, vertically over the terrestrial equator, on 21st March and 23rd September. Then the day and night are equal all over the earth, whence the name *equinox*. See *Equinoctial*.

**Equatorial**, an astronomical instrument contrived for the purpose of directing a telescope upon any celestial object, and of keeping the object in view for any length of time, notwithstanding the diurnal motion of the earth. For these purposes

a principal axis resting on firm supports is mounted exactly parallel to the axis of the earth's rotation. To this there is attached a telescope moving on an axis of its own. The two axes carry graduated circles, with the help of which the telescope can be pointed to any star. By means of clockwork the star is kept stationary in the field of view.

**Equestrian Order**, the order of 'Knights' in Rome. The *equites* or knights originally formed the cavalry of the army. About the time of the Gracchi (123 B.C.) the *equites* became a distinct order in the state. They held their position in virtue of a certain property qualification. The insignia of their rank, in addition to a horse, were a gold ring and a robe with a narrow purple border.

**Equidae**, the horse family, a division of the odd-toed (perissodactyle) Ungulates or hoofed mammals. The domesticated horse (*Equus caballus*) has a large tail abundantly hair-clad, and is not known with certainty in the wild state, though possibly the tarpan of South Russia (Tatary) may represent the original stock. The domestic ass (*E. asinus*) is related to a number of wild species, such as the onager (*E. onager*) of South Asia, the kiang (*E. hemionus*) of Tibet, and two African species (*E. africanus* and *E. somalicus*). The striped zebras are purely African, and four species are generally recognized—the common or mountain zebra (*E. zebra*), Burchell's zebra (*E. burchelli*), Grevy's zebra (*E. grevyi*), and the quagga (*E. quagga*).

**Equinoctial**, the celestial equator (see *Equator*).—*Equinoctial gales*, storms which have been supposed to take place at the vernal and autumnal equinoxes, in March and September.—*Equinoctial points* are the two points in which the celestial equator and ecliptic intersect each other; the one, the first point of Aries, is called the *vernal* point; and the other, in Libra, the *autumnal* point. These points move backward or westward at the rate of  $50''$  of arc in a year. This is called the *precession of the equinoxes*.

**Equinox**. See *Equator*; *Seasons*; &c.

**Equisetales**, a group of Pteridophytes, represented at the present day only by the genus *Equisetum* (q.v.). It was much more prominent in the Carboniferous flora, in which large woody horse-tails (Calamites) played an important part.

**Equisetum**, a genus of vascular cryptogamous plants often called *horse-tails*.

**Equity**, in English law, the system of supplemental law, administered originally by the Chancellor and afterwards by the Court of Chancery, to enforce primarily the execution of *trusts*, for those the old common law courts did not recognize and had no forms or machinery to deal with. Since the great reform of the Judicature Act, 1873, all courts recognized equitable estates and interests, though actions for the administration of trusts in the High Court of Justice are assigned to the Chancery Division.

**Erard, Sébastien** (1752-1831), French musical-instrument maker. He made considerable improvements in the mechanism of the harp and of the pianoforte.

**Erasistratus** (third century B.C.), Greek physician and anatomist, said to have been a grandson of Aristotle. He was the first who systematically dissected the human body, and his description of the brain and nerves is much more exact than any given by his predecessors.

**Erasmus, Desiderius** (1467-1536), Dutch scholar. He became the instructor of several rich Englishmen, and accompanied them to England in 1497. In 1510 he revisited England, and wrote his *Praise of Folly* while residing with Sir Thomas More. He was appointed Lady Margaret professor of divinity and Greek lecturer at Cambridge. In 1514 he returned to the Continent and lived chiefly at Basle, where he died. To extensive learning Erasmus joined a refined taste and a delicate wit, and rendered great and lasting service to the cause of reviving scholarship. He edited various classics, the first edition of the Greek Testament from MSS. (with Latin translation), &c., but his best-known books are the *Encomium Morie* (Praise of Folly) and his *Colloquies*. His letters are very valuable in reference to the history of that period.—BIBLIOGRAPHY: S. Knight, *Life of Erasmus*; C. Butler, *Life of Erasmus*.

**Erastus**, the learned name of Thomas Lieber (1523-1584), Swiss theologian. In his writings he maintained the complete subordination of the ecclesiastical to the secular power.

**Eratosthenes** (276-194 B.C.), Greek astronomer. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic.

**Erbil** (formerly *Arbela*), a place in the vilayet of Baghdad, giving name to the decisive battle fought by Alexander the Great against Darius in 331 B.C. at Gaugamela about 50 miles away.

**Erbium**, a rare metal found along with yttrium, terbium, and other rare elements in some rare minerals. Its properties are but little known. It was discovered by Mosander in 1843.

**Ercilla y Zúñiga, Alonso de** (1533-1595), Spanish soldier and poet. His epic *La Araucana* is written in excellent Spanish, and occupies an honourable position in the national literature.

**Erckmann-Chatrian**, the joint name of two French-Alsatian writers of fiction, Émile Erckmann (1822-1899) and Alexandre Chatrian (1826-1890). Among their most popular books are: *L'Ami Fritz*, *Madame Thérèse*, *Histoire d'un Conscrit de 1813*, *L'Histoire d'un Paysan*, and *Waterloo*. Their drama *Le Juif Polonais* was made famous by Sir Henry Irving under the name of *The Bells*.

**Erebus, Mount**, a volcano of the Antarctic regions, in South Victoria Land; height, 12,400 feet.

**Erfurt**, an important town in the Prussian province of Saxony, on the River Gera, formerly a fortress with two citadels but now dismantled. Erfurt is a busy industrial town. The industries are varied, including clothing, machinery, leather, shoes, ironmongery, and chemicals. Flower-growing is extensively carried on in the neighbourhood, plants and seed being produced for sale in great quantities. Pop. (1925), 135,579.

**Ergot**, the altered grain of rye and other grasses caused by the attack of an ascymetous fungus called *Claviceps purpurea*. The grain is replaced by a dense fungoid tissue (sclerotium) largely charged with an oily fluid. In its perfect state this germinates and produces the *Claviceps* fructification. When diseased rye of this kind is eaten in food for some time, it sometimes causes death by a kind of mortification called dry gangrene. Ergot is used in obstetric practice to promote the contraction of the uterus.

**Erica**, the heaths, a large genus of branched rigid shrubs, of which five species are British. The leaves are narrow and rigid; the flowers are globose or tubular, and four-lobed.

**Ericaceæ**, a natural order of gamo-

petalous Dicotyledons. Representative genera: Calluna, Erica, Rhododendron.

**Erichsen**, Sir John Eric (1818-1896), British surgeon. In 1850 he became professor of surgery and hospital surgeon at University College, London. His most important work was his *Science and Art of Surgery* (1853). He also published a volume on *Concussion of the Spine* (1875).

**Ericsson**, John (1803-1889), Swedish-American engineer. His chief inventions are his caloric engine, the screw propeller (1836), which has revolutionized navigation, and his turret-ships, the first of which, the *Monitor*, distinguished itself in the American Civil War.

**Erie**, one of the great chain of North American lakes, between Lakes Huron and Ontario, about 265 miles long; area, 6900 sq. miles. The whole of its southern shore is within the territory of the United States, and its northern within that of Canada. It receives the waters of the upper lakes by Detroit River, and discharges its waters into Lake Ontario by the Niagara River. The Welland Canal enables vessels to pass from it to Lake Ontario. It is subject to violent storms. The principal harbours are those on the United States side—Buffalo, Erie, and Cleveland.

**Erie**, a city of Pennsylvania, U.S.A., an important railway and commercial centre on the southern shore of Lake Erie. There are numerous ironworks (including foundries, rolling-mills, and blast-furnaces), petroleum refineries, breweries, tanneries, and wood-working factories. The harbour is one of the best on the lake. Pop. 93,372.

**Erie Canal**, the largest in the United States, serving to connect the great lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 363 miles long; surface width 70 feet, and depth 7 feet. It is carried over several large streams on stone aqueducts. The navigation is free.

**Erigena**, Joannes Scotus (c. 800-c. 877) (*Scotus*, Scot, and *Erigena*, Irish-born), mediaeval scholar and metaphysician. He composed a treatise against Godeschalc on *Predestination and Free-will*. This treatise and another, *De Divisione Naturæ*, contained many views in opposition to the teachings of the Church. They were condemned by the Councils of Valencia in 855 and of Langres in 859.

**Erinna**, a Greek poetess who lived about

600 B.C. She is said to have been an intimate friend of Sappho (q.v.), and died at the age of eighteen. Her works are lost.

**Eris**, in Greek mythology, the goddess of discord, the sister of Ares, and, according to Hesiod, daughter of Nyx (night).

**Erith**, a summer-resort of England, in Kent, on the Thames. Pop. (1931), 32,780.

**Eritrea**, the official name of an Italian colonial possession stretching along the African shore of the Red Sea, and between it and Abyssinia. The coast-line is about 670 miles in length, the area of the colony about 45,800 sq. miles. Pop., largely nomadic, about 450,000. The chief town is Massawa.

**Erivan**, a fortified city in Armenia, formerly the capital of a Russian government of the same name in Transcaucasia, on the Sanga, north of Mount Ararat. It has a citadel, a cannon-foundry, and some manufactures. Pop. (1926), 62,180. Near Erivan is the Echmiadzin, a monastery where resides the Catholicos or head of the Armenian Church.

**Erivan, Armenian Republic of** (Armenia), is a Transcaucasian Soviet Republic. In 1917 Transcaucasia refused to recognize the Bolsheviks, and in April, 1918, a separate Transcaucasian Republic was formed. This, however, dissolved in May, and Georgia and Armenia declared their independence. The Armenian Republic was recognized by the Allies in January, 1920, and its *de jure* recognition was embodied in the abortive Treaty of Sèvres between the Allies and Turkey in August, 1920. Armenia was declared a Socialist Soviet Republic in 1921. It is bounded by Georgia, Azerbaijan, Persia, and Asia Minor; area, 11,940 square miles. The rest of ancient Armenia is divided between Persia (6520 sq. miles) and Turkey (35,600 sq. miles), and is still claimed by the Armenians. Armenia occupies the uplands between the Iranian Plateau and Asia Minor, and the surface is really a series of plateaus culminating in Mount Ararat (17,325 feet). It is watered by the Euphrates, Tigris, Aras, and Kur. The climate in the uplands is severe, but the valleys are fertile and produce cereals, cotton, flax, rice, tobacco, and fruit. Sericulture, sheep-breeding, and fruit-growing are capable of great and profitable development. The mineral wealth is enormous: naphtha, sulphur, bitumen, and nitre abound, and in the mountains



gold, silver, copper, and salt are found. An electric power station was erected at Erivan in 1926 and the construction of other stations was commenced. Erivan (pop. 75,000) is the capital, and Batum, in Georgia, is a free port to all Transcaucasian states. The population of Armenia in 1926 was 876,721. For history, religion, literature, &c., see *Armenia*.—BIBLIOGRAPHY: Kevork Aslan, *Armenia and the Armenians*; W. L. Williams, *Armenia, Past and Present*; N. Ter Gregor, *History of Armenia*.

**Erlangen**, a town of Bavaria, 10 miles N.N.W. of Nürnberg. The Protestant university, founded in 1743, is the chief institution. The industries include cotton spinning and weaving, mirrors, hosiery, gloves, and combs. Pop. (1925), 29,957.

**Ermine**, the stoat (*Putorius ermineus*), a mammal of the weasel family widely distributed through the northern parts of both hemispheres, with a considerable



Ermine (*Putorius ermineus*)

range to the south. In winter, in cold countries or severe seasons, the fur changes from a reddish-brown to a yellowish-white, or almost pure white, under which shade the animal is recognized as the ermine. In both states the tip of the tail is black. Its fur is short, soft, and silky, the best skins being brought from Russia, Sweden, and Norway.

**Erne, Lough**, a lake, Fermanagh,

Northern Ireland, consisting of a north or lower, and a south or upper lake (with the town of Enniskillen between), properly forming only expansions of the River Erne. Its entire length is about 40 miles. The River Erne rises in Longford, and falls into Donegal Bay. Length, 72 miles.

**Erosion Theory**, in geology, the theory, now held by all geologists, that valleys are, in the great majority of cases, due to the wearing influences of subaerial agents, such as rivers and glaciers, as opposed to the theory which regards them as the result of fissures in the earth's crust produced by strains during its upheaval.

**Erratics**, or **Erratic Blocks**, in geology, boulders or large masses of angular rock which have been transported to a distance from their original positions by the action of ice during a glacial period. Thus masses of Scottish and Lake-district granites and of Welsh rock occur not uncommonly in the surface soil of the Midland counties of England.

**Erromanga**, one of the more important of the New Hebrides Islands, with an area of about 400 sq. miles. Oranges and sandalwood grow, and sheep are reared. Pop. about 2500, including 1200 Christians.

**Erskine, Ebenezer** (1680-1754), Scottish divine. His attitude towards patronage and other abuses in the Church led to his being deposed; when, in conjunction with his brother and others, he founded the Secession Church. Erskine was the leader of the Burghers.

**Erskine, Henry** (1746-1817), Scottish barrister. He twice held the office of Lord-Advocate, was for long the leader of the Scottish Bar, and held a high reputation as a wit.

**Erskine, John**, of Carnock (1695-1768), Scottish jurist. He was author of *Principles of the Law of Scotland* and the *Institutes of the Law of Scotland*.

**Erskine, Ralph** (1685-1752), Scottish divine, brother of Ebenezer Erskine. His *Gospel Sonnets* and other religious works were once very popular.

**Erskine, Thomas**, Lord Erskine (1750-1823), Scottish lawyer. After serving four years in the navy and seven in the army, he was called to the Bar. In 1789 he defended Stockdale, a bookseller, for publishing what was charged as a libellous pamphlet in favour of Warren Hastings. In 1792 he was employed to defend Thomas Paine, when prosecuted for the

second part of his work *The Rights of Man*. In the trials of Hardy, Tooke, and others for high treason in 1794, which lasted for several weeks, the ability displayed by Erskine was acknowledged by all parties. On the death of Pitt, in 1806, Erskine was created a peer and raised to the dignity of Lord Chancellor.

**Ervm.** See *Lentil*.

**Eryngium**, a genus of plants belong to the nat. ord. Umbellifere. There are upwards of 100 species found in temperate and subtropical climates but chiefly in South America. *E. maritimum*, also called sea-holly, is the only truly native British species.

**Erysipelas**, Rose, or St. Anthony's Fire, is a contagious disease of the skin due to infection by a germ, the Streptococcus, and accompanied by severe general disturbance. Cold, damp weather favours its appearance. It rarely affects those under fifteen years, and is commoner in women than men. The disease is characterized by sudden onset, with shivering, headache, vomiting, and occasionally sore throat, followed by the appearance of the typical erysipelatous flush on the skin of the affected part, most usually the face. This part becomes deep red, and is much swollen, with a glossy, tender surface. Serum treatment has been used, but so far there have been very conflicting results.

**Erysiphales**, an important family of ascomycetous Fungi, distinguished by the presence of typical sexual organs and closed ascus-fruits. They are all parasites, appearing on leaves, stems, or fruits as white patches of mycelium ('mildew'). During summer innumerable conidia are produced, which spread the disease rapidly; in autumn the black ascus-fruits develop and carry the fungus through the winter.

**Eryx**, an ancient city and a mountain in the west of Sicily, about 2 miles from the sea-coast. The mountain, now Monte San Giuliano, rises direct from the plain to a height of 2184 feet.

**Erzberger**, Matthias (1875–1921), German politician. He became prominent in 1917 as a peace advocate. He was Secretary of State in 1918, and became Minister of Finance in 1919 in Bauer's Cabinet, but was compelled to resign in 1920. He was murdered on 26th Aug., 1921, by two young men of the militarist party.

**Erzerum**, a city of Asiatic Turkey,

forming an important strategical centre. The Moslem element prevails largely over the Christian. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade, and is a chief halting-place for Persian pilgrims on their way to Mecca. Pop. (1927), 77,966.

**Erzgebirge**, a chain of European mountains forming a natural boundary between Saxony and Bohemia, nearly 120 miles in length and 25 miles broad. The mountains are rich in silver, iron, copper, lead, cobalt, and arsenic.

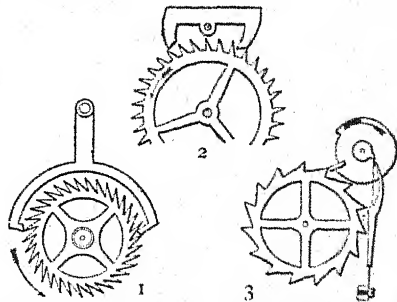
**Erzsebetfalva**, a town of Hungary, 8 miles south-east of Budapest. It is a popular summer-resort. Pop. 40,545.

**Esarhaddon** (died c. 667 B.C.), the son of Sennacherib, and one of the most powerful of all the Assyrian monarchs.

**Esbjerg**, a Danish seaport in South-West Jutland, opposite the Island of Fanø. It exports bacon and dairy produce, and has important fisheries and manufactures. There is accommodation for vessels drawing 20 feet. Pop. 18,000.

**Escallonia**, a genus of saxifragaceous shrubs and trees, natives chiefly of the Andes. *E. rubra* is an evergreen shrub. It is hardy in many parts of Britain, and makes an excellent hedge, especially near the sea.

**Escanaba**, a town of Michigan, U.S.A., situated on a bay of Lake Michigan. It has an excellent harbour, and trades in coal, iron ore, and fish. The chief industries are connected with lumber and the making of furniture. Pop. 13,103.



1, Dead-beat escapement. 2, Recoil escapement.  
3, Chronometer escapement

**Escapement**, the general contrivance in a timepiece by which the pressure of

the wheels (which move always in one direction) and the vibratory motion of the pendulum or balance-wheel are accommodated the one to the other. By this contrivance the wheelwork is made to communicate an impulse to the regulating power (which in a clock is the pendulum and in a watch the balance-wheel), so as to restore to it the small amount of energy which it loses in every vibration, in consequence of friction and the resistance of the air. See *Clock*; *Watch*.

**Escar**, or **Esker**, a geological formation in the superficial drift, generally consisting of a long linear ridge of sand and gravel, sometimes including blocks of considerable size. In Sweden escars have been formed, season by season, at the mouths of glacier-tunnels as the ice shrank back, the ice-front opening on a lake. See *Kames*.

**Esch** a **Alz**, a town, Luxembourg, the centre of the mining industry. Pop. 21,208.

**Escheat**, in law, was the term formerly employed to denote a reversion of land in default of heirs on the death of the owner intestate. If a person dies intestate now and has no relations qualified to succeed to his land, it goes to the Crown or to the Duchy of Lancaster or to the Duke of Cornwall for the time being.

**Eschwege**, a town of Prussia, province of Hesse-Nassau. It has manufactures of woollen, cotton, and linen cloths, and there are also tobacco-factories and tanneries. There is a trade in fruit and agricultural produce. Pop. 12,540.

**Eschweiler**, a town of Prussia, in the province of Rheinland, on the Inde. It is the seat of manufacturing industries, especially in iron, copper, and zinc, and has coal-mines. Pop. 24,718.

**Escobar y Mendoza**, Antonio (1589-1669), Spanish casuist and Jesuit. His casuistry was severely criticized by Pascal in his *Lettres Provinciales*.

**Escorial**, a building in Spain, comprising at once a palace, a convent, a church, and a mausoleum. It is distant from Madrid about 24 miles in a north-westerly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. It was begun in 1563 and finished in 1584. The library contains a valuable collection, including a rich store of Arabic MSS. The Escorial was

partly burned in 1671, when many MSS. were destroyed, and was pillaged by the French in 1808 and 1813. In 1872 it was struck by lightning, and suffered serious damage.

**Esdras**, **Books of**, two apocryphal books, which, in the *Vulgate* and other editions, are incorporated with the canonical books of Scripture. In the *Vulgate* the canonical books of *Ezra* and *Nehemiah* are called the first and second, and the apocryphal books the third and fourth books of *Esdras*.

**Eserine**, or **Physostigmine**, a drug obtained from Calabar-bean, the active principle of this plant, used as a remedy in cases of tetanus (lockjaw). A solution of eserine dropped in the eye causes contraction of the pupil, and hence its use in some eye ailments, as, for instance, glaucoma.

**Esk** (Celtic for water), the name of two small rivers in England—one in Cumberland and the other in Yorkshire; and of several in Scotland, the chief being the Esk in Dumfriesshire, and the North Esk and South Esk in Forfarshire.

**Eski-Djumna**, a town of Bulgaria, on the northern slope of the Binar-Dagh. Pop. 10,000.

**Eskilstuna**, a town of Sweden, on a river of the same name connecting Lake Maclar with Lake Hjelm, with ironworks and manufactures of steel goods and weapons. Pop. 30,288.

**Eskimos**, a physically stunted race inhabiting the Arctic regions of North America. They consist of three principal stocks—the Greenlanders; the Eskimos proper, in Labrador; and the Western Eskimos, found along Hudson Bay, the west of Baffin Bay, the polar shores as far as the mouths of the Coppermine and Mackenzie Rivers, and both on the American and Asiatic sides of Behring Strait. The Eskimos number about 27,000, 15,600 living in North America and 11,000 in Greenland. They live in tents in summer and in snow houses in winter, their clothing consists of furs, and their food is mainly the flesh of whales, seals, and walrus. They are expert hunters and trappers, and their principal weapons are bows and arrows and spears. Their only domestic animal is the Eskimo dog.—Cf. V. Stefansson, *My Life with the Eskimo*.

**Eski-Shehr**, a town of Asia Minor, 90 miles south-east of the Sea of Marmara,

with warm baths and manufactures of meerschaum pipes. Pop. 20,000.—The vilayet has a population of 141,558.

**Esmarch**, Johannes Friedrich August von (1823–1908), German surgeon. He originated valuable improvements in barrack-hospitals and ambulances, and introduced the antiseptic treatment into Germany.

**Esmeraldas**, a maritime province in the extreme north of Ecuador. It is unhealthy on the coast, and has vast forests in the interior. Area, 5200 sq. miles; pop. 14,600.—The capital *Esmeraldas* has a population of 4000.

**Esneh**, a town of Upper Egypt, on the left bank of the Nile. Among the ruins there is a beautiful portico of twenty-four lofty and massive columns, belonging to a temple of Kneph. Esneh has a caravan trade, manufactures cottons and pottery, and is very healthy. Indigo dyeing is a staple industry. There is an irrigation barrage here. Pop. 15,800.

**Esocidæ**, the family of fishes to which the true pike (*Esox lucius*) belongs, as also the much larger maskinongy (*E. nobilior*) of America.

**Españolat**, a province of the Dominican Republic; pop. 50,956.—The town *Españolat* has a population of 3994.

**Espartero**, Baldomero (1792–1879), Duke of Vittoria, Spanish statesman. He was regent of the kingdom from 1841 to 1843, and again head of the Government from 1854 to 1856. In 1870 his name was vaguely put forward in the Cortes as a candidate for the throne.

**Esparto**, or *Alfa*, a plant growing in Spain and North Africa, long applied to the manufacture of cordage and matting, and also extensively used for paper-making. This plant, called by botanists *Stipa* or *Macrochloa tenacissima*, is a species of grass 2 to 4 feet high, covering large tracts in its native regions, and also cultivated, especially in Spain.

**Esperanto**, an artificial language for international use invented by Dr. Zamenhof of Warsaw, who first published an account of it in 1887. Its structure is simple. There are no exceptions to the rules. The essential roots number only some 2000, including grammatical inflexions, prefixes, and suffixes, and these are chosen from the principal European languages in such a way as to make their mastery easy. All nouns end in *-o* in

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the singular, and all adjectives in *-a*. The plural of these is formed by adding *-j* (pronounced *y*). All derived adverbs end in *-e*. The only case inflexion is *-n* for the objective. The definite article is *la* in all cases and numbers, and there is no



Esparto or Alfa

indefinite article.—**BIBLIOGRAPHY:** J. C. O'Connor, *Esperanto: the Student's Complete Text-Book* (revised by Dr. Zamenhof); Underhill, *Esperanto and its Availability for Scientific Writings*.

**Esperanza**, La, a town, Republic of Honduras. Pop. 11,453.

**Espionage** is the acquirement of infor-



mation by secret methods and by special agents, as opposed to its acquirement openly by combatants in the ordinary course of military operations. Espionage is recognized by international law under the Hague Convention, Article 24 of the Annex to which reads as follows: "Ruses of war and the *employment of measures necessary for obtaining information* about the enemy and the country are considered permissible." Espionage is carried on both in peace and war, but the conditions under which secret service agents work differ to a very marked extent according to the state of affairs between the two countries. In peace-time, though many countries maintain secret service agents in other states, yet these same agents can expect no assistance from their Governments in the event of their being detected. In this case it is a diplomatic fiction that nothing is known of them or of the reasons for their activities. The agent, therefore, in consideration of a sufficient allowance, takes the risk of a lengthy term of imprisonment if he is so unfortunate as to be found out. In time of war the condition of non-interference naturally exists as a matter of course, and the secret service agent or spy is liable to the death penalty if discovered, and the fact that he has or has not obtained and transmitted information does not affect the case. In a military sense a spy means a man, whether soldier or civilian, who penetrates in disguise behind the enemy lines and brings back information about his dispositions. By the customs of war the penalty inflicted on a spy caught in the act is death after trial; but should a man known to have acted as a spy on some former occasion be subsequently captured in the course of military operations, he cannot be punished for his former act, and must be treated as a prisoner of war.

**Espirito-Santo**, one of the maritime states of Brazil; length, about 260 miles; breadth, about 120 miles; area, 17,308 sq. miles; pop. 457,328. It is well watered, and produces cocoa, coffee, sugar, and tobacco. It has valuable forests.

**Espirito-Santo**, an island of the Pacific, the largest of the New Hebrides, with some 20,000 inhabitants. It is 75 miles long, 45 miles broad, and is very fertile. It exports cocoa, sugar, cotton, and coco-nuts.

**Esquimault**, a harbour and naval station on the south-east coast of Vancouver Island. The harbour is almost landlocked, and is capable of giving safe anchorage to a fleet of vessels of the largest size. It is the station of H.M. ships on the Pacific coast, and is a fortified naval arsenal. There are several dry-docks, and one to accommodate the largest vessels afloat is under construction. Pop. 5000.

**Esquimaux**. See *Eskimos*.

**Esquire**, originally, a shield-bearer or armour-bearer; an attendant on a knight. In England this title is properly given to the younger sons of noblemen, to officers of the king's courts and of the household, to counsellors at law, justices of the peace while in commission, sheriffs, gentlemen who have held commissions in the army and navy, &c. It is usually put as a complimentary adjunct to almost any person's name.

**Esquiros**, Henri Alphonse (1812-1876), French writer. He published *Les Chants d'un Prisonnier*, poems written in prison, where he had been sent for writing a life of Christ; *Les Vierges Folles*; *Les Vierges Sages*; and *L'Histoire des Montagnards*. Having to leave France in 1851, he resided for years in England, and wrote a series of essays on English life and character, which were translated under the title of *The English at Home*, and were very popular.

**Essad Toptani**, Pasha (1856-1920), Albanian soldier and national leader. He was in command of the troops at Scutari when the Powers declared in favour of the autonomy of Albania in 1912. He had hoped to be chosen ruler of the new state of Albania created by the Treaty of London, but accepted the office of Minister of War and of the Interior. At the outbreak of the European War he was appointed by the Senate (on 5th Oct., 1914) President of the Provisional Government. In spite of Austrian advances he declared war on the Central Powers, and escaped when the Austrians entered Albania. He rendered valuable services to the Allies at Salonica, but the Italians, who saw in the Pasha an enemy to their own views upon Albania, refused to grant him permission to return to his country. He was assassinated in Paris by an Albanian student.

**Essay**. The essay was the invention

of Montaigne in the sixteenth century, and Francis Bacon was another illustrious author who employed the literary form of the essay. There is a class of English writers to whom the descriptive term *essayist* is applied, the most illustrious being Addison, Steele, Charles Lamb, Hazlitt, De Quincey, Macaulay, Carlyle, Froude, Matthew Arnold, R. L. Stevenson, and Austin Dobson.

**Essen**, a town of Rhenish Prussia, situated between the Ruhr and the Emscher, and celebrated for the steel and iron-works of Krupp. This great establishment was started in 1827 with two workmen; in 1918 the number of employees was 27,000. Pop. (1925), 470,524.

**Essenes**, or **Essæans**, a sect among the Jews. The Essenes appear to have sprung up in the course of the century preceding the Christian era, and disappeared on the dispersion of the Jews after the siege of Jerusalem. They were remarkable for their strictness and abstinence, and had a rule of life analogous to that of a monastic order.

**Essential Oils**. An essential oil is distinguished from a fatty oil by its characteristic odour, and by being slightly soluble in water and more volatile. Most of the essential oils are decomposed by alkali, but they do not yield soaps as do the fatty oils. The extraction of these oils from plants containing them is usually accomplished by a process of distillation with water. In some cases this is not practicable, as the oil may be decomposed by water, e.g. to obtain the essential oil from violets the flowers are macerated with hot lard; the fat absorbs the essential oil, which is then extracted from the lard by means of alcohol. In other cases the oil is extracted by means of a solvent such as petroleum spirit. Large quantities of essential oils are extracted yearly for the preparation of perfumes, the preparation of various flavourings (essences), and for use in the soap industry. Many essential oils are now manufactured synthetically, e.g. oil of wintergreen owes its fragrance to methyl salicylate, pineapple oil to ethyl butyrate, pear oil to amyl acetate.

**Essequibo**, a river of British Guiana, which flows into the Atlantic by an estuary 20 miles in width after a course of about 450 miles.—The district or division of Essequibo is well cultivated and ex-

tremely fertile, producing coffee, cotton, cocoa, and sugar.

**Essex**, Earl of. See *Cromwell, Thomas*.

**Essex**, Robert Devereux, second Earl of, in the Devereux line (1566-1601). Having appeared at Court, he soon became a favourite of Queen Elizabeth. In 1596 he was commander of the troops in an expedition against Spain, and distinguished himself by the capture of Cadiz. In 1599 he was appointed Lord-Lieutenant of Ireland, which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. In February, 1601, he foolishly tried to excite an insurrection in London. After a skirmish with a party of soldiers he was compelled to surrender, sent to the Tower, and executed for treason.

**Essex**, a maritime county in the south-east of England, bounded by Suffolk, the Thames, Hertford, and Middlesex; area, 979,532 acres. The surface is generally level except in the north-west, where it is undulating. The soil is extremely fertile, and particularly well adapted for the growth of wheat. The other principal productions are beans, potatoes, barley, oats, mangolds, turnips, tares, rape, mustard, and trefoil. The raising of caraway, coriander, and teazel is almost peculiar to this county. The principal rivers in the county are the Roding, Crouch, Chelmer, Blackwater, and Colne. It has also the Thames, Lea, and Stour as boundary rivers. On the coast are some valuable oyster-beds. The manufactures are not very extensive, the chief being crape, silks, and straw-plait. The chief towns are: Chelmsford, the county town; West Ham, Colchester, Southend, and Harwich. Pop. (1931), 1,755,240.—Cf. *Victoria History of the Counties of England*.

**Esslingen**, a town of Germany, in Württemberg, on the Neckar. It has walls, a castle, and an ancient Gothic church. There are manufactures of machinery, articles of wood, cutlery, philosophical instruments, and spinning and other mills. Pop. (1925), 40,586.

**Estate**, the interest or quantity of interest a man has in lands, tenements, or other effects. Estates are *real* or *personal*. *Real estate* comprises lands, tenements, and hereditaments, held in freehold. *Personal estate* comprises interests for terms of years in lands, tenements,

and hereditaments, and property of every other description. *Real estate* descends to heirs; *personal* to executors or administrators.

Estates of the Realm, in Britain, are the Lords Spiritual, the Lords Temporal, and the Commons.

Este, a town of North Italy, 16 miles south-west of Padua. It has manufactures of silk goods, earthenware, and majolica; and numerous silk-mills and whetstone quarries. Pop. 11,704.

Estepona, a seaport of Southern Spain, province of Malaga, 23 miles north-east of Gibraltar. Pop. 9600.

Esters, or Ethereal Salts, in chemistry, a general term for substances formed by the union of an acid and an alcohol with elimination of water. Thus ethyl acetate is formed from ethyl alcohol and acetic acid. Many of them are volatile, pleasant-smelling substances.

Eston, a town of England, North Riding of Yorkshire, with important steelworks and iron-mines. Pop. (1931), 31,142.

Estonia, a republic of North-Western Europe, formerly a dependency of Imperial Russia. It is situated on the Baltic, and is bounded by the Gulf of Finland, Russia, Latvia, and the Baltic Sea. The Republic comprises the former Russian government of Estland, the northern part of Livonia, and portions of certain other provinces, the total area being 18,353 sq. miles; pop. 1,110,538. The boundary with Russia was fixed by the Peace Treaty of February, 1920, and that with Latvia was demarcated in July of the same year. Estonia is divided into eleven districts. The capital, Revel, on the Gulf of Finland, has a population of 132,000, and is a busy port. Other towns are Dorpat, Parnu, and Narva, the last of which is a manufacturing town. The Republic has, for the most part, a flat or undulating surface. The whole of the north side, however, rises considerably above the sea, and presents to it ranges of high cliffs. The Narva is the only river of any importance, but there are numerous small rivers and lakes. About a fourth of the surface is covered with forests of pine, birch, and alder, while one-half is devoted to agriculture. The agricultural land was at one time divided into great landed properties, but a recent Agrarian Reform Bill has parcelled these estates out to the peasants. The principal crops are rye, wheat, barley,

and potatoes; flax, hops, and tobacco are also grown. Cattle are reared extensively, there are productive sea fisheries, and there are 3738 industrial establishments employing about 35,500 men. In 1929 the total value of exports was 117,471,300 Estonian kroons, and of imports 122,967,500 Estonian kroons. The principal exports were timber, potatoes, paper, flax, cement, and spirits. The Estonian mercantile marine consists of 74 steamers and 291 sailing-vessels, with a total tonnage of 74,012 tons. There are 731 miles of railway track. The currency unit became, in 1928, the *kroon* of 100 *sents*, the value being the same at that of the Swedish *krone* (1s. 1½d.). Five-sixths of the people are Lutherans and the rest are mainly Greek Catholics. Elementary education is free and compulsory, there are numerous secondary, trade, and training schools, and at Dorpat is the Estonian university (reconstituted 1919). By the Constitution adopted in 1920 the power of the State is in the hands of the people, to whom the sovereign power is assured by means of elections to the *Riigikogu* or State Assembly, the referendum, and the right of initiating new laws. The executive power consists of the *Riigivanem* (State Head or President) and the ministers, who are chosen by the Assembly. Military service is compulsory. In the tenth and twelfth centuries Estonia belonged to Denmark, and after being annexed by Sweden it was seized by Russia in 1710. After the Russian Revolution, Estonia declared her independence in Feb., 1918, and was recognized as a *de facto* independent state by Britain, France, Italy, Japan, Poland, and Sweden in May, 1919. An armistice with the Bolshevik Government was concluded in Dec., 1919. In Nov., 1924, as a result of Russian propaganda, a Communist rising took place in Revel, and was only put down after much bloodshed. For map see *Baltic States*.—BIBLIOGRAPHY: John Buchan, *The Baltic and Caucasian States*; E. Vesterinen, *Agricultural Conditions in Estonia*.

Estremadura, a western division of Spain, consisting of the provinces of Badajoz and Caceres. It is fertile, but not cultivated to its full extent. The Tagus and Guadiana intersect it east to west. Immense flocks of sheep graze on the rich plains. The area is about 16,000 sq. miles, and the pop. 1,064,998.

**Estremadura**, a maritime province of Portugal, divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous. Wines and olives are the principal products. The principal city is Lisbon. Area, 6937 sq. miles; pop. 1,544,704.

**Eszek**, a town of Yugoslavia, on the Drava, 13 miles from its confluence with the Danube. It has barracks, silk-factories, flour-mills, a large trade, and several fairs. Pop. 31,000.

**Esztergom (Gran)**, a town in Hungary, at the confluence of the Gran and the Danube, 35 miles north-west of Budapest. It has a fine cathedral, and is an agricultural centre. Pop. 17,120.

**Etah**, a town and district of Agra Division, United Provinces, India. The town has a population of 9000. The district (area, 1737 sq. miles; pop. 900,000) is well cultivated, producing wheat, barley, cotton, sugar-cane, and indigo.

**Étampes**, a town of France, department of Seine-et-Oise, 30 miles south by west of Paris. It is a great market for agricultural produce. Pop. 9450.

**Étapes**, a town of Northern France, department of Pas-de-Calais, on the right bank of the estuary of the Canche. It was a huge British encampment during the European War. Pop. 6000.

**Etawah**, a town, India, United Provinces, capital of district of the same name, on left bank of the Jumna. It has a considerable trade in cotton and oil-seeds. Pop. 45,350.—The district has an area of 1694 sq. miles, and a pop. of 760,120, and produces wheat, grain, barley, and cotton.

**Etching**, a method of engraving lines upon a metal plate by means of acid. The usual process is to cover the plate (generally of copper) with an *etching-ground* of waxes and resins, on which the lines are opened up by means of a sharp-pointed *etching-needle*, either from a design transferred to the ground, or by the artist working directly. The lines are then *bitten* by putting the plate into dilute nitric or hydrochloric acid, the back and edges being protected by *stopping-out varnish*. The plate is removed when the lightest lines are sufficiently bitten. If some lines need deeper biting, the rest may be covered with stopping-out varnish, and the plate replaced in the acid; or acid may be applied locally. In *soft-*

*ground etching*, the ground is mixed with tallow, thin paper laid upon it, and the design firmly drawn thereon with a pencil. When the paper is removed, the ground adheres to it where the lines were drawn. The plate is bitten in the usual way. This produces the effect of a chalk or pencil drawing. *Dry-point* is a method of working direct on to the copper with a sharp point, which raises a *burr* on each side of the line, giving it a characteristic quality. *Dry-point*, etching proper, and engraving proper are often combined in one plate; and a mixture of etching with mezzotint or aquatint is not uncommon. In *printing*, a matter of first-rate importance, the ink is rubbed into the lines and superfluous ink *wiped* from the surface of the plate, ink being left in any place where a tint is required. Impressions may then be taken by hand; but a press is generally used, being more expeditious and yielding more even results. The papers used are various, but those of Japanese make are most popular.

The earliest-known etching is dated 1513. Among the first to use the process was Albrecht Dürer (1471–1528) (q.v.). Among the earliest Italian etchers were Francesco Mazzuoli (1503–1540) and Andrea Schiavone (1522–1582). But at this time etching was mainly the by-product of artists whose chief work was painting or engraving. Its great period opened in the seventeenth century. Jacques Callot (1592–1635) (q.v.) produced about one thousand plates of small size. Claude Lorrain (1600–1682), the landscape painter, produced some fifty plates. Sir Anthony Van Dyck (1599–1641), beside being court painter to Charles I of England, was the greatest Flemish etcher of his day. But the central figure in etching, not only of the seventeenth century but of all time, is Rembrandt van Ryn (1606–1669) (q.v.). In the eighteenth century etching fell somewhat into disuse, save in Italy, where G. B. Tiepolo (1696–1770) produced some fifty plates, and Canaletto (1697–1768) a few. In England, William Hogarth (1697–1764) produced some etchings; Thomas Rowlandson (1756–1827), the caricaturist, used etching as the basis of his aquatints; and John Crome (1768–1821), the landscape painter, etched some characteristic plates. The 71 plates of the *Liber Studiorum* are one of the most remarkable works of J. M. W. Turner



(1775-1851). In these etching merely provides the ground plan for the use of mezzotint, or, more rarely, aquatint. In the nineteenth century the revival was carried on in France by several of the Barbizon group of landscape painters, notably by J. F. Millet (1814-1875), responsible for some simple but impressive plates. A more important figure as an etcher is Alphonse Legros (1837-1911). Apart from other etchers of the period are Jules Jacquemart and Félix Braquemond. Of the Impressionist painters, Camille Pissarro (1830-1903) produced some very individual plates. The chief figure in nineteenth-century etching, however, is J. A. M'N. Whistler (1834-1903). Part of his success was due to insistence upon printing his own plates. His brother-in-law, Sir Francis Seymour Haden (1818-1910), took a prominent part in the revival of etching. William Strang (died 1921) has produced many notable portraits. The most notable recent etchers are chiefly found in England, and include Sir Frank Short, Sir D. Y. Cameron, Muirhead Bone, James M'Bey, and Augustus John. See *Engraving*.—Cf. A. M. Hind, *A Short History of Engraving and Etching*.

**Eteocles and Polynices**, two heroes of Greek legend, sons of Oedipus, King of Thebes. After their father's banishment from Thebes, Eteocles usurped the throne to the exclusion of his brother, an act which led to an expedition of Polynices and six others against Thebes. This war is known as the Seven against Thebes. The two brothers fell by each other's hand. See *Antigone*.

**Etesian Winds**, winds which, blowing over the Mediterranean regions from a general northerly direction during some weeks of the summer, replace the heated air that rises from the Sahara and other parts of Africa. By carrying with them moisture from the sea, they add greatly to the fertility of Egypt.

**Ethane**, ( $C_2H_6$ ), a hydrocarbon belonging to the paraffin series. It is a colourless, inflammable gas, and is found amongst the gaseous constituents of the Pennsylvanian oil-wells.

**Ethelbert** (552-615), King of Kent. He succeeded his father, Hermenric, and reduced all the English states, except Northumberland, to the condition of his dependents. Ethelbert married a Christian princess, an event which led indirectly to

the introduction of Christianity into England by St. Augustine.

**Ethelbert** (d. 866), King of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in A.D. 857, and in 860, on the death of his brother Ethelbald, became sole king. His reign was much disturbed by the inroads of the Danes.

**Ethelred I** (d. 871), King of England, son of Ethelwulf, succeeded his brother Ethelbert in A.D. 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom. Ethelred was succeeded by his brother Alfred.

**Ethelred II** (968-1016), King of England, son of Edgar, succeeded in 978, and, for his want of vigour and capacity, was surnamed *the Unready*. In his reign began the practice of buying off the Danes by presents of money. Sweyn eventually obliged the nobles to swear allegiance to him as King of England; while Ethelred, in 1013, fled to Normandy. On the death of Sweyn he was invited to resume the government, and died at London in the midst of his struggle with Canute (1016).

**Ethelwulf** (d. 858), King of England, succeeded his father, Egbert, about A.D. 837. His reign was in great measure occupied in repelling Danish incursions. Alfred the Great was the youngest of his five children.

**Ethendun, Battle of**, the victory which Alfred the Great gained over the Danes (878), and which led to the treaty with Guthrum, the Danish king of East England.

**Ether**, or **Æther**, sometimes called *luminiferous ether* to prevent confusion with the well-known volatile liquid of the same name, a hypothetical medium filling the whole of what seems to be empty space, and even the interstices between the atoms of material bodies. Most thinkers have believed that such a medium must be postulated if we are to explain the transmission of physical actions between bodies at a distance from one another. The ether is incomparably more elusive than air. It affects the sense of sight, indeed, as the air affects the sense of hearing; but, so far as we know, it has no weight, no specific heat, no chemical affinity. Except that it is the medium which conveys light, electric and magnetic actions, and possibly gravitation, we know

extremely little about it. An extreme school of modern physicists is even inclined to deny, or at least to ignore, its existence altogether.

Early speculators regarded the ether as a species of fluid, which could be displaced by ordinary matter, so that upholders of the wave theory of light necessarily thought of waves like those of sound, in which the direction of vibration is in the line of transmission, for no other kind of wave can occur in a fluid. Young and Fresnel, however, insisted on the view that the movements of the medium are at right angles to the direction of propagation, and pointed out that this might be explained by supposing the medium to possess elasticity of shape. Some of the greatest mathematical physicists, such as Cauchy, Green, and Lord Kelvin, have tried, and with very considerable success, to explain the properties of light by means of an elastic solid ether, but it is now almost universally agreed that the vibrations of an ordinary elastic solid do not furnish an exact parallel to the vibrations which constitute light. Elastic solid theories have fallen into the background before the advancing popularity of the electro-magnetic theory of James Clerk Maxwell. Maxwell's equations of the electro-magnetic field are deduced from easily demonstrable experimental facts, supplemented by the characteristic hypothesis that the electric current always travels in a closed circuit, even in cases where, as in the discharge of a condenser, the material circuit is open, so that the path of the current has to be completed through the ether. 'Maxwell's equations', especially as modified by H. A. Lorentz so as to take account of the atomic structure of electricity, are fundamental in modern electrodynamics and the electron theory of matter. The form of Maxwell's equations shows that electro-magnetic action can be propagated in waves with a definite velocity, which depends on the specific inductive capacity and the magnetic permeability of the medium. Maxwell had no difficulty in showing from experimental data that the velocity given by his theory, which turns out to depend on the ratio of the electrostatic and electro-magnetic units of charge, is identical with the known velocity of light. He concludes that waves of light are electric waves. The actual production of waves

by electrical means was experimentally demonstrated by Sir Oliver Lodge, and more completely by Heinrich Hertz, and is now a commonplace of wireless telegraphy and telephony.

The extraordinary developments in both theoretical and experimental physics during recent years have diverted attention to some extent from the question of the constitution of the ether, and the problem of its mode of working is more frequently considered from a mathematical and pseudo-metaphysical point of view than from the old standpoint of Newtonian dynamics. It was from a question about the ether, however, that the theory of relativity, the most important of recent speculations, took its origin. Is the ether fixed, or does it move? Is it carried along with the earth in its motion round the sun, or does the ether pass through the atoms of material bodies as the sea passes through the meshes of a net? The celebrated interference experiment of Michelson and Morley, which was capable of detecting a comparatively small relative velocity of earth and ether, gave a null result. We are thus placed in a dilemma. We must either reconcile the idea of a fixed ether with the Michelson-Morley and kindred experiments, or we must explain aberration on the supposition that earth and ether move together. Both alternatives have had their supporters. Those who believe in a fixed ether rely on the hypothesis of the 'Fitzgerald contraction', according to which bodies moving through the ether are contracted in the direction of their motion. This contraction is in ordinary cases very small, amounting only to a few inches for the diameter of the earth when moving round the sun. At present the fashionable view of all the phenomena is that taken in Einstein's theory of relativity (q.v.). Once its initial assumptions are granted, this theory undoubtedly gives simple and natural explanations of the chief optical and electrical phenomena. Most English writers on the subject, among whom A. S. Eddington, E. Cunningham, and A. N. Whitehead are prominent, continue to believe that an ether exists, in spite of the fact that as relativists they hold that no experiment can ever enable us to determine our motion through it.—BIBLIOGRAPHY: E. T. Whittaker, *History of the Theories of Æther and Electricity*; A. S.

Eddington, *Space, Time, and Gravitation*.

Ether, or Ethyl Ether,  $(C_2H_5)_2O$ , a colourless, inflammable liquid produced by distillation of alcohol with concentrated sulphuric acid. It is almost immiscible with water, lighter than alcohol, has a sweet taste, and evaporates rapidly in air, producing extreme cold. The vapour of ether mixed with air forms an explosive mixture. Ether is a valuable solvent for many organic substances, fats, oils, &c., and is also used in surgery as an anæsthetic.

Etherege, Sir George (1635–1691), English writer of comedy. In 1664 he had his first comedy represented, *The Comical Revenge, or, Love in a Tub*. Four years later his *She Would if She Could* appeared. Eight years afterwards (1676) he produced his best comedy, *The Man of Mode, or, Sir Fopling Flutter*. Therege's plays are witty and sparkling, and the characters are vividly if lightly drawn.

Ethics, or Moral Philosophy, is a normative science which seeks to formulate standards, judged in accordance to which the characters and conduct of men may be said to be *right* or *wrong*, *good* or *evil*. The purpose of ethics is further elucidated when one considers the words *right* and *good*. *Right* means according to rule, so that right conduct is that which follows the conventional scheme. Rules, however, have always reference to some result to be achieved, and, while a thing is good when it is valuable as a means to an end, *good* also signifies the end itself, the *summum bonum*. Ethics, then, as the science of conduct, has for its consideration the discovery of the *summum bonum*, and has direct reference to the aims after which men strive and to the types to which they wish to approximate. Such aims are never ultimate, and therefore it is too much to assume that there is one definite goal. There is, however, an *ideal* in life—a standard of judgment by reference to which conduct can be examined. Ethics is purely speculative, though the *Utilitarian School* (Bentham, Mill, Spencer, Leslie Stephen) have maintained that its purpose is to secure the greatest happiness of the greatest number. A great number of ethical systems have been proposed, and in antiquity the names of Socrates, Plato, Aristotle, the Cynics, and the Stoics were especially prominent. The Greek philosophers considered ethics from

an individualistic standpoint without reference either to politics or sociology. With the introduction of Christianity ethics became intimately associated with theology, and morality was regarded as regulated by a definite code contained in the sacred writings. Some Christian moralists (Anselm, Augustine, Peter Lombard) attempted to harmonize the Greek theories with Christian dogmatics. Most modern systems consider the subject apart from theology, and fall into one of two great classes—the utilitarian, which has been dealt with, and the rationalistic, which insists that ideas of law and obligation can have their source only in reason. The best-known rationalists are Clarke, Butler, Reid, Stewart, and Kant. The study of ethics is closely connected with the study of theology, psychology, politics, economics, and jurisprudence.—BIBLIOGRAPHY: Sir L. Stephen, *The Science of Ethics*; H. Sidgwick, *The Method of Ethics*; Green, *Prolegomena to Ethics*; J. S. Mackenzie, *A Manual of Ethics*.

Ethiopia, in ancient geography, the country lying to the south of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia, and other adjacent districts. In ancient times its history was closely connected with that of Egypt, and about the eighth century B.C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. Ethiopia became tributary to the Romans in the reign of Augustus. The Abyssinian monarchs still call themselves rulers of Ethiopia, by which name their kingdom is often referred to.

Ethiopian Language, the old official and ecclesiastical language of Abyssinia. It is a Semitic language resembling Aramaic and Hebrew as well as Arabic. It has a Christian literature of some importance. The principal work is a translation of the Bible, to which are appended some non-canonical writings, such as the *Shepherd of Hermas* and the *Book of Enoch*.

Ethnology and Ethnography, terms used very loosely and in a variety of ways, often being confused with *anthropology*, the general science or natural history of mankind, of which the other two are parts. In this article it will be convenient to give a brief sketch of the early history of the human family, with special reference to its differentiation into races and the beginnings of civilization.

Within the last century the discovery of a series of fossilized remains of extinct genera and species of the human family and of apes has given us a glimpse of the origin and early history of mankind. Man's ancestors probably parted company with those of the anthropoid apes somewhere in the neighbourhood of Northern India early in the Miocene period; and before the close of the Pliocene period their descendants had gradually acquired the highly developed brain and the intelligence which imply the emergence of the distinctively human characteristics. The most significant token of the attainment of the status of men was the acquisition of the power of speech, which enabled its possessors to hand on the accumulated knowledge and the fruits of experience, and so enormously to increase their powers. The earliest-known representative of the human family was the Ape-man, *Pithecanthropus*, who at the end of the Pliocene period wandered east as far as Java, where the fossilized remains of a skull were found in 1891 by Professor Eugen Dubois. At a later date a much more highly developed type wandered as far west as England, where a representative of this extinct genus was discovered in 1912 at Piltdown, in Sussex. This very primitive member of the human family has been called the 'Dawn-man' or *Eoanthropus*. He has a brain which, though poorly developed, is definitely human, but his face (and especially the jaws) retains considerable resemblance to that of an ape. Of the other fossilized remains of extinct varieties of the human family, the most important are those known respectively as Heidelberg man and Neanderthal man. The former is almost as old as the Piltdown man, and its former existence was revealed by the discovery in the Mauer Sands, near Heidelberg, in 1908, of a very massive and chinless jaw. At a much later date Europe was inhabited by a brutal species of mankind, Neanderthal man. A skull found in Rhodesia in 1921 probably belonged to a man of the Neanderthal type. Another South African skull, discovered in 1924, seems to represent an extinct race of highly developed apes, to which the name *Australopithecus* has been given. In spite of their enormous strength, the Neanderthal people were not able to hold their own in competition with the nimbler wits and the more skilled hands of *Homo*

*sapiens*, who introduced into Europe a more finished technique in making implements, and revealed his genius and manual dexterity in the remarkable pictures which he painted on the walls of caves, especially in Southern France and Northern Spain. An extremely primitive race, the aboriginal Australian, has survived until the present time to demonstrate the original type of *Homo sapiens*. The proto-Australians separated from the rest of mankind and wandered east. Long afterwards, another group wandered west, and, probably in tropical Africa, became specialized in structure to become the Negro race. The negro, like the Australian, retains many primitive characters, such as the black skin and the small brain, but in other respects, such, for example, as the extremely flattened and curved hair ('peppercorns'), he has become highly specialized and sharply differentiated from all other varieties of mankind. The Bantus are negroes who mixed in early times with the proto-Hamitic peoples of East Africa, whence the mongrel population moved south, driving the Bushmen and Hottentots before them.

After the ancestors of the Australian and Negro races had separated from the rest of mankind, which had spread throughout a great part of Asia, North-Eastern Africa, and Europe, the coming of the Glacial epoch created barriers of ice which shut up the various groups each within its own domain. Somewhere in Eastern Asia, possibly in the basin of the Yellow River, the proto-Mongolian race gradually assumed its characteristic traits. In East Africa and the neighbouring tract of Asia the ancestors of the Brown or so-called Mediterranean race were free to roam east and west from India to the African and European coasts of the Atlantic. Farther north, probably in Europe, the Nordic or Blond race assumed its distinctive features; and somewhere in the region between its area of characterization and that of the Yellow race—probably in the region to the north-east of the Caspian—the so-called Alpine (Armenoid) or proto-Slav race developed. At the close of the Glacial epoch, when the melting of the ice unlocked the domains of these races, members of the Alpine race poured into Asia Minor and Syria, and down to the head of the Persian Gulf; they also made their way north of the Caspian and Black



Sea into Europe, mingling there with the Nordic people. But they also moved east in Siberia and mingled with the proto-Mongolian race. It was soon after this event that members of the proto-Mongolian stock, possibly with some admixture of people of the Central race, wandered to North-Eastern Asia and crossed the Behring Strait to colonize America for the first time.

From the Alpine race there sprang, besides the Slavs, the Armenians and the Northern Semites. The Slav branch of this race was making its way into Europe long before the Neolithic phase of culture there. It passed north of the Black Sea via Poland. But at the end of the Neolithic phase there were two streams of other branches of the race—the true Alpine subdivision passing from Anatolia into the Carpathians and the Alps, to Switzerland, Bavaria, Savoy, and Brittany, and the Maritime division passing round the coasts to the Iberian Peninsula, the British Isles, and Western Europe.

From very early times there has been an intermingling of the different races. In India the original pre-Dravidian (proto-Australian) aborigines became diluted with a large influx of the Brown race to form the Dravidian people, who acquired a high civilization from the west. At a later date people of the Alpine race speaking an Aryan language swarmed through the north-western frontier and introduced their language and culture into India. Before this happened the Brown race had extended farther east and provided the basis for the population of Indonesia, supplanting to a great extent the earlier proto-Australian and Negroid peoples there. Then the Malays came down from the north and added to the Indonesian mixture a strong Mongolian element. The greed for the riches of the head-waters of the Yenesei has made Siberia the home of strife for fifty centuries, and has led to a puzzling admixture of races in the affected area. A peculiar branch of the northern Mongols is clearly differentiated from the rest to form the Eskimo people who occupy Greenland and Arctic America. They present a marked contrast to the American Indians. The American Indian may be regarded essentially as a branch of the proto-Mongolian race. But on the Pacific littoral the people of the states where a high civilization prevailed ten

centuries ago—Mexico, Central America, Peru, and Chile—are clearly differentiated from the rest of the American population by the more obtrusive evidence of admixture with Polynesian and Asiatic peoples.

From the beginning man was a maker of implements of stone and bone; but for a vast number of centuries he was merely a hunter who did not attempt anything more in the way of industry. Civilization probably originated in the Nile Valley when men found barley growing there naturally, and discovered that it provided them with a supply of food which could maintain them throughout the year. Pottery was probably invented as an outcome of the mode of life and the needs of these early agriculturists, and the domestication of cattle and the use of their milk for food helped to neutralize the ill-effects of a too exclusively cereal diet. When gold came to be regarded as a precious substance, men began to search for it far and wide, incidentally spreading abroad the germs of the arts and crafts, the beliefs and practices of our common civilization. The people who introduced the Neolithic culture into Europe brought with them from Egypt a knowledge of agriculture, of pottery-making, of domestication of animals, of linen, and of the characteristic burial customs and religious beliefs. But these rudiments of civilization were also diffused to Crete and Cyprus, to Syria and Asia Minor, to Elam and Sumer by prospectors searching for the things which the growth of civilization was making valuable, the incense and the timber, the gold and precious stones, the copper and other metals. Crete was inoculated with the germs of civilization by Egypt directly, as well as indirectly, from Asia Minor, which was subjected to the double influence of Egyptian and Sumerian culture. In the neighbourhood of the south-eastern corner of the Caspian the alloy bronze was probably invented soon after 3000 B.C. by mixing tin and copper; and the influence of this epoch-making event rapidly spread to Babylonia, to Crete, and to Europe, where it inaugurated the Age of Bronze. It also spread to China, to India, and many centuries later across the Pacific to Central America. The needs of the early Egyptians compelled them to devise sea-going ships, which in turn became the models of the Cretans, the people of East Africa, the Babylonians,

# ETHNOLOGY



Australian



Akka Pygmy (Negrito)



Vedda, full-face and profile (Pre-Dravidian)



Papuan



Bushman



Solomon Islander (Melanesian)



Andaman Islander (Negrito)



Nubian Girl



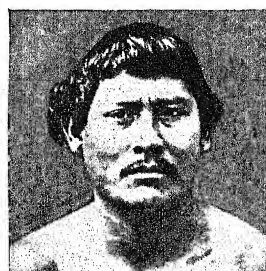
Tsjareg (Western Hamite)



Zulu (Bantu)



Somali (Ethiopian Hamite)



Carib (Southern American)



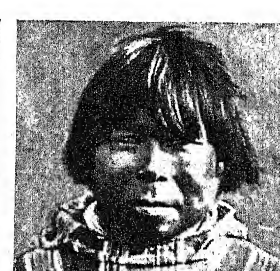
Javanese (Oceanic Mongol)



Maori (Polynesian)



Sikh (Indo-Aryan)



Eskimo



Lapp (Mongoloid)



Chinese Man and Woman (Southern Mongol)



Kalmuk (Northern Mongol)



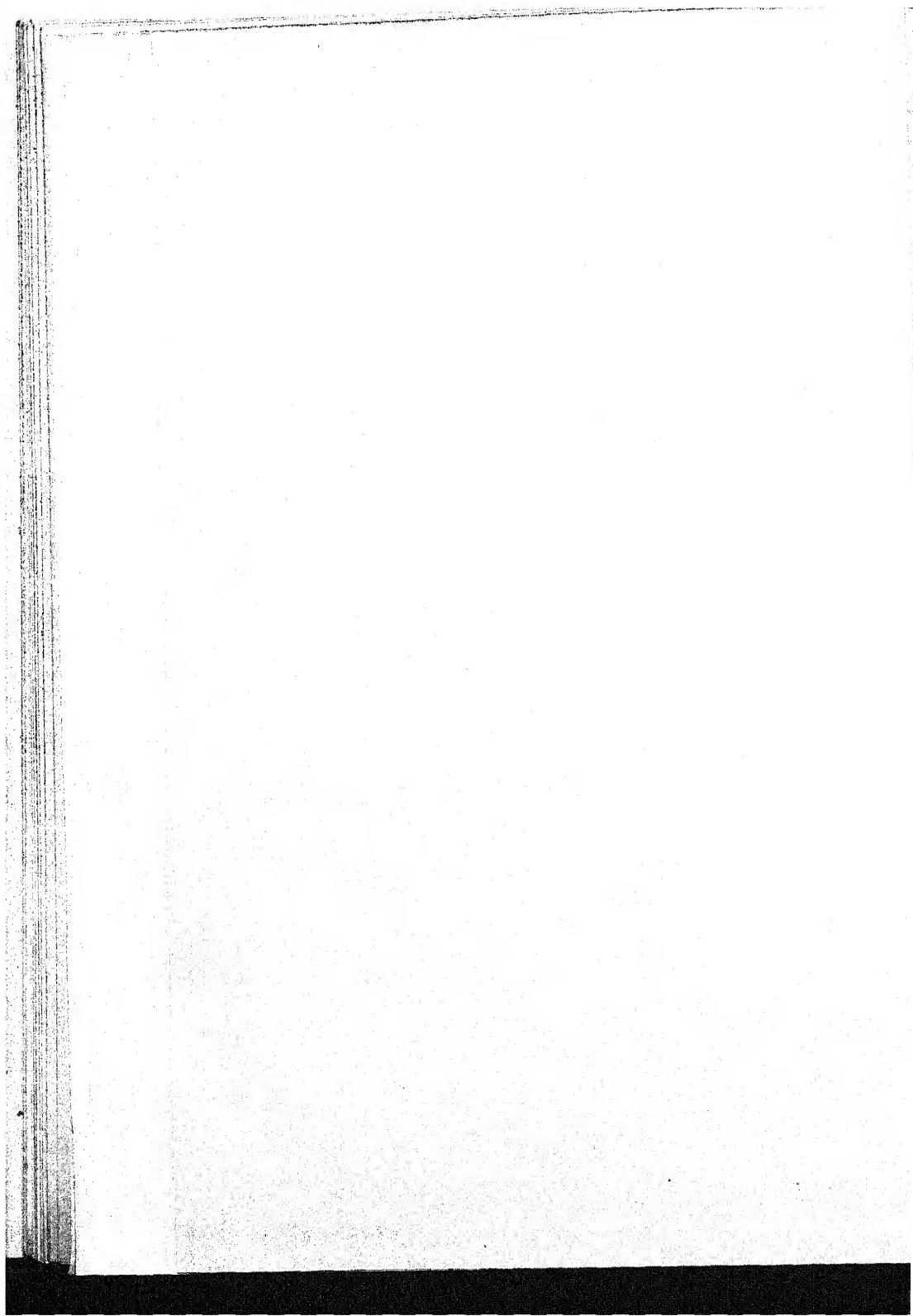
North American Indian



Turk



Arab (Semite)



the Phœnicians, and the Greeks. The search for gold and pearls led early mariners to Southern India and Ceylon, to Burma and Indonesia, to the whole coast-line of Eastern Asia, New Guinea, and Melanesia, and in course of time to Polynesia and the coasts of Central America and Peru. The germs of the ancient civilizations of Central America and Peru were carried across the Pacific from Cambodia and Indonesia between the years 300 B.C. and A.D. 1000. See *Geography*.—BIBLIOGRAPHY: A. H. Keane, *Man, Past and Present*, revised edition by A. Hingston Quiggin and A. C. Haddon, is a useful guide to the literature of anthropology and ethnology; see also Robert Munro, *Prehistoric Britain*; W. J. Sollas, *Ancient Hunters and their Modern Representatives*; D. A. Mackenzie, *Ancient Man in Britain*; G. Elliot Smith, *The Migrations of Early Culture*; such periodicals as the *Journal of the Royal Anthropological Institute*, *Man*, and especially *L'Anthropologie*, give the current literature.

**Ethyl**, the name given to the radicle  $C_2H_5$ , contained in ether,  $(C_2H_5)_2O$ , alcohol,  $C_2H_5OH$ , &c. *Ethyl* has not been isolated, as it immediately combines with another *ethyl* group forming diethyl or butane,  $C_2H_5-C_2H_5$ . *Ethyl chloride*,  $C_2H_5Cl$ , formed by the action of hydrochloric acid on alcohol, is much used for the production of low temperature—as a local anæsthetic. *Ethyl nitrite*,  $C_2H_5NO_2$ , constitutes *sweet spirits of nitre* when dissolved in alcohol.

**Ethylene**, or **Olefiant Gas**,  $C_2H_4$ , an unsaturated hydrocarbon, the first member of the olefine series. It is a colourless gas with a faint odour, and burns with a bright luminous flame. It is a constituent of ordinary coal-gas, and may be obtained from alcohol by heating it with twice its volume of concentrated sulphuric acid.

**Etiolation**, or **Blanching**, of plants, is a state produced by the absence of light, by which the green colour is prevented from appearing. It is effected artificially, as in the case of celery, by raising up the earth about the stalks of the plants; by tying the leaves together to keep the inner ones from the light; by covering with pots, boxes, or the like; or by setting in a dark place. Etiolated plants are also abnormal in other respects.

**Etive**, **Loch**, an inlet of the sea on the west coast of Scotland, Argyllshire, nearly 20 miles long. The scenery of its shores

is very beautiful, and the Rivers Etive, Awe, and Kinglass are renowned for salmon and trout fishing. Connel Ferry and Dunstaffnage Castle are on Loch Etive.

**Etna**, **Mount**, the greatest volcano in Europe, a mountain in the province of Catania, in Sicily; height, 10,758 feet. It rises immediately from the sea, and has a circumference of 90 miles. The top is covered with perpetual snow; midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, &c. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by about 200 minor cones. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. There were also eruptions in 1775, 1832, 1865, 1874, 1879, and 1886. Among more recent eruptions are those of 1892, 1899, 1911, and 1914. The population of the district of Etna is about 300,000.

**Eton**, a town of England, in Buckinghamshire, on the left bank of the Thames opposite Windsor. Eton derives its celebrity wholly from its college, called the King's College of Our Lady of Eton beside Windsor, one of the great public schools of England, founded by Henry VI in 1440. The college foundation now consists of provost, ten fellows (the nominal governors), vice-provost, headmaster, lower masters, seventy scholars, and two conductors (or chaplains). The oppidans, or boys not on the foundation, number about 1100, and there are twenty-seven houses. Pop. (1931), 2005.

**Etruria**, the name anciently given to that part of Italy which corresponded partly with the modern Tuscany. The name of Tuscus or Etrusci was used by the Romans to designate the race of people anciently inhabiting this country, but the name by which they called themselves was Rasena. Etruria proper was in a flourishing condition before the foundation of Rome, 753 B.C. It was known very early as a confederation of



twelve great cities, each of which formed a republic by itself. After a long struggle with Rome, the Etruscan power was completely broken by the Romans in a series of victories, from the fall of Veii in 396 B.C. to the battle at the Vadimonian Lake (283 B.C.). The Etruscans had attained a high state of civilization. They carried on a flourishing commerce, and at one time were powerful at sea. Of the Etruscan language little is known, although about 6000 inscriptions have been preserved. Etruscan art was in the main borrowed from Greece. For articles in terra-cotta, a material which they used mainly for ornamental tiles, sarcophagi, and statues, Etruscans were especially celebrated. In the manufacture of pottery they had made great advances; but most of the painted vases popularly known as Etruscan are undoubtedly productions of Greek workmen.—Cf. G. Dennis, *Cities and Cemeteries in Etruria*.

Etruria, a village of England, in Staffordshire, between Hanley and Burslem, famous as the place where Josiah Wedgwood established his pottery-works in 1769. It is in the city of Stoke-on-Trent.

Etruscan Vases, a class of beautiful ancient painted vases made in Etruria, the workmanship, subjects, style, and inscriptions being all Greek. One class has black figures and ornaments on a red ground—the natural colour of the clay; another has the figures left of the natural colour and the ground painted black. The former class belong to a date about 600 B.C., the latter date about a century later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. Many curious particulars may be learned from these vase pictures regarding the Hellenic ritual, games, festivities, and domestic life.

Ettrick, a pastoral district of Scotland, in Selkirkshire, watered by the Ettrick, and anciently part of Ettrick Forest. The Ettrick receives the Yarrow 2 miles above Selkirk, and enters the Tweed 3 miles below.

Etty, William (1787–1840), English painter. Among his works is a series of three pictures on the subject of Judith, now in the National Gallery of Scotland. Others of note are: *The Judgment of Paris*; *The Rape of Proserpine*; and *Youth at the Prox*, and *Pleasure at the Helm*.

Etymology, that branch of philology

which traces the history of words from their origin to their latest form and meaning. Etymology is amongst the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. It was not till recent times, however, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. The result was a great advance in etymological knowledge and the formation of a new science of *philology* (q.v.).

Eu, a town in Northern France, department of Seine-Inférieure. It is notable for its old twelfth-century church and the celebrated Château d'Eu. Pop. 4900.

Eubœa, formerly called Negropont, a Greek island, the second largest island of the Aegean Sea. It is 90 miles in length; 30 miles in greatest breadth, reduced at one point to 4 miles. It is separated from the mainland of Greece by the narrow channels of Euripus and Talanta, and is connected with the Boeotian shore by a bascule bridge. The island is hilly, well-wooded, and remarkably fertile. Wine is a staple product, and cotton, wool, pitch, and turpentine are exported. The chief towns are Chalcis and Karysto. With some small islands it forms a modern nomarchy, with a pop. (1928) of 154,449. See *Chalcis*.

Eucalyptus, a genus of trees, nat. ord. Myrtaceæ, mostly natives of Australia, and remarkable for their gigantic size, some of them attaining the height of 480 or 500 feet. In the Australian colonies they are known by the name of gum trees, from the gum which exudes from their trunks. The wood of some is excellent for building and many purposes. The *E. globulus*, or blue gum, yields an essential oil which is valuable in medicine as a febrifuge, antasthmatic, and antispasmodic, as a disinfectant, and as an astringent in affections of the respiratory passages. The *E. globulus* and the *E. amygdalina* have been found of great value in combating malaria in marshy districts. *E. mannifera* and others yield a sweet secretion resembling manna. Some, especially *E. rostrata*, yield a kind of gum kino. The Eucalyptus has been introduced with



may improve or impair the racial qualities of future generations, either physically or mentally". It is concerned with the investigation of the physical, mental, and moral traits of mankind, and especially with the factors of inheritance of desirable and undesirable qualities. Sir Francis Galton devoted most of his life to the study of the manifold problems that came within the scope of 'eugenics', and founded the Galton Chair of Eugenics in the University of London. Eugenic enthusiasts stress the importance of the influence of heredity and claim that many diseases, such as tuberculosis, epilepsy, and certain types of mental trouble, are mainly due to inherited predisposing tendencies. They hold, too, that drunkenness is to a large extent caused by hereditary weakness. Thus they underestimate the importance of social environment, education, and similar forces. In spite of the obvious defects of its more extravagant claims, eugenics is a valuable science, and may, if its principles are properly applied, have far-reaching effects on social conditions.

**Eugénie** (1826–1920), wife of Napoleon III, Emperor of the French, who married her in 1853. When the war broke out with Germany, she was appointed regent (15th July, 1870) during the absence of the emperor, but on the 4th Sept. the Revolution forced her to flee from France. She went to England, where she was joined afterwards by the emperor. They lived at Camden House, Chislehurst. In 1879 her only son, the Prince Imperial (born 1856), was slain while with the British army in the Zulu War. In 1881 the empress transferred her residence to Farnborough, in Hampshire.—**BIBLIOGRAPHY:** De Lano, *The Empress Eugénie*; J. T. Stoddart, *The Life of Empress Eugénie*.

**Euler, Leonard** (1707–1783), Swiss mathematician. He was educated at the University of Basle under the Bernouillis, through whose influence he procured a place in the Academy of St. Petersburg. In 1741 he became professor of mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg. Euler's contributions to analysis and analytical mechanics make his name an outstanding one in the history of mathematics. Amongst his numerous writings are: *Theoria Motuum Planetarum et Cometarum*, *Introductio in Analysin Infinitorum*, and *Opuscula Analytica*.

**Eumenides.** See *Furies*.

**Eumycetes.** See *Fungi*.

**Eunonymus**, the spindle trees or prick-woods, a genus of shrubs or trees, nat. ord. Celastrineæ, common in the eastern United States. The bark is used in medicine.

**Eupatoria** (Koslov), a seaport on the western coast of the Crimea. The industries are tanning and soap-boiling, and there is a large trade in grain, wool, hides, and salt. There is good anchorage in 5 fathoms. Pop. 30,432, mainly Tatars, Jews, and Armenians.

**Eupatorium**, a genus of plants, chiefly natives of America, belonging to the nat. ord. Compositeæ. Amongst the many species are *E. cannabinum*, or hemp-agrimony, a British plant.

**Eupen**, a town and district of Belgium, 7 miles s.s.w. of Aix-la-Chapelle. It has manufactures of woollen and linen cloth, hats, soap, leather, and chemicals; paper, flax-, and worsted-mills; and an important trade. Ceded to Prussia in 1814, Eupen again became Belgian by the Treaty of Versailles (1919). Pop. 13,540.

**Euphorbiaceæ**, the spurge-worts, a natural order of herbaceous plants, shrubs, or very large trees. Among the genera are: *Euphorbia*, which yields an oil used as a powerful cathartic; *Croton*, affording croton-oil; *Ricinus communis*, the castor-oil plant; *Buxus sempervirens*, the box-wood plant; and *Mammoth utilissima*, which yields the food known as tapioca or cassava.

**Euphrates**, a river of Mesopotamia, having a double source in two streams rising in the Anti-Taurus range in Armenia. Its total length is about 1750 miles, and the area of its basin 260,000 sq. miles. It flows through the great alluvial plains of Babylonia and Chaldaea till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 miles from its mouth it is joined by the Tigris, when the united streams take the name of Shatt al 'Arab. It is navigable for about 1200 miles, but navigation is somewhat impeded by rapids and shallows. In the Bible (*Gen. xv, 18*) the Euphrates is *The River*, or *The Great River*.

**Euphuism**, an affected style of speech derived from *Euphuus*, the *Anatomy of Wit* (about 1580), and *Euphuus and his England* (about 1582), both written by John Lyly (1554–1606). The chief charac-

teristics of genuine euphuism were extreme artificiality and numerous allusions to natural history embellished by imagination.

**Eupolis** (c. 446–411 B.C.), Athenian comic poet. His best-known plays, which only survive in fragments, are the *Kolakes* (Flatterers), in which he attacked the prodigal Callias, and the *Baptes* (Dippers), in which he attacked Alcibiades and the exotic ritual practised at his clubs.

**Eure**, a river of North-West France, which rises in the department of the Orne, and falls into the Seine after a course of 124 miles, being navigable for about half the distance. It gives its name to a department in the north-west of France forming part of Normandy; area, 2330 sq. miles. The surface consists of an extensive plain intersected by rivers, chief of which is the Seine. It is extensively cultivated; apples, pears, plums, and cherries form important crops, and a little wine is produced. The mining and manufacturing industries are extensive, and the department has a considerable trade in woollen cloth, linen and cotton fabrics, carpets, leather, paper, glass. Evreux is the capital. Pop. (1926), 308,445.

**Eure-et-Loir**, a department in the north-west of France; area, 2291 sq. miles. A ridge of no great height divides the department into a north and a south basin, traversed respectively by the Eure and the Loire. The soil is extremely fertile, and there is scarcely any waste land. A considerable portion is occupied by orchards and vineyards, but the greater part is devoted to cereal crops. The department has few manufactures. The capital is Chartres. Pop. (1926), 255,213.

**Eurhythmics**, a system of education evolved by Émile Jaques-Dalcroze of Geneva. It aims at training musical sense on the broadest lines, using the body as an instrument of expression. Exercises at the piano are played to which the pupil listens, and to which he responds in movement—movement so closely allied to the music that it is a form of musical imagery. The system claims to free innate rhythm, to develop it for individual self-expression, and to bring mind and body into closer unity and in their interaction to give poise to both.

**Euripides** (480–406 B.C.), the last of the three great Greek writers of tragedies. His first play (not preserved), the *Peliades*,

was produced when he was twenty-five years of age. He is said to have written ninety-two dramas, eight of which were satyr-plays. Ancient critics allow seventy-five of these to have been genuine. During his long career he only won the first prize five times. Euripides left Athens about 409 B.C., and went to the court of King Archelaus in Macedonia, where he died three years later. Seventeen tragedies and one satyr-play have been preserved to us. The latter (*The Cyclops*) is interesting as being the only example of a satyr-play which we possess. In itself it is not amusing. It has been admirably translated by Shelley. The seventeen tragedies in the order of their production are: *Alcestis*, *Medea*, *Hippolytus*, *Hecuba*, *Andromache*, *Ion*, *Suppliants*, *Heracleidae*, *Hercules Furens*, *Iphigenia among the Tauri*, *Trojan Women*, *Helena*, *Phaenissa*, *Electra*, *Orestes*, *Iphigenia at Aulis*, and *The Bacchae*. The *Rhesus*, a feeble production long attributed to Euripides, is almost certainly not his work. The work of Euripides still retains the power of arousing strong likes and dislikes. His aim was rather different from that of the earlier poets, and he must be judged, not by their standards, but on his own merits. The fact remains, however, that the extant plays of Euripides are of very unequal merit. The *Helena* is not a good play; it was ridiculed by Aristophanes, but he did not succeed in making it much more absurd than it was already. The *Hecuba* and the *Heracleidae* are not well constructed, and the *Electra* and *Orestes* challenge too directly the masterpieces of the earlier tragedians. In his greatest plays, however, Euripides can bear comparison with any poet. The *Medea* is a play which still never fails to please; the *Hippolytus* and the *Ion* are admirable dramas and admirably constructed; above all, the *Bacchae* is a masterpiece, more picturesque than any other Greek tragedy, a play not unworthy to be set near *The Tempest* and *Cymbeline*. For better and for worse Euripides is a very modern poet, and makes a special appeal to the present generation. But his pathos, his wide sympathies, and his wonderful poetry have appealed to the best judges in all ages. Theocritus, Virgil, Ovid, Horace, Milton, and Browning have been among his admirers; his detractors include a few Teutonic professors, and a few who honour the memory of Æschylus



and Sophocles on the other side idolatry. —BIBLIOGRAPHY: A. W. Verrall, *Euripides the Rationalist*; G. G. A. Murray, *Euripides and his Age* (Home University Library); W. B. Donne, *Euripides* (Ancient Classics for English Readers). There is a complete verse translation by A. S. Way, and verse translations of several plays by G. G. A. Murray. There is a 'transcript' of the *Alcestis* in Browning's *Balaustion's Adventure*, and of the *Hercules Furens* in his *Aristophanes' Apology*.

**Euripus**, the strait between the Island of Eubœa and Bœotia in Greece, now spanned by a bascule bridge.

**Europa**, in Greek mythology, the daughter of Agénor, King of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed

the form of a white bull, and swam with his prize to the Island of Crete.

**Europe**, almost the smallest in area, but by far the most important politically and historically, of the five great continents. It forms a huge peninsula attached to Asia, and is bounded on the east by the Ural Mountains, the Ural River, and the Caspian Sea; on the south by the Caucasus Mountains, the Black Sea, and the Mediterranean; on the west by the Atlantic; and on the north by the Arctic. The length of the continent from Cape Matapan in Greece to North Cape in Lapland is 2875 miles; the greatest breadth from Cape St. Vincent through Ekaterinburg to the boundary-line is 3450 miles; and the total area is about 3,865,000 sq. miles (see table below). The coast-line, which is greatly indented, extends to almost 50,000 miles;

State.	Form of Government.	Area in Sq. Miles.	Population.
Albania	Became a kingdom in September, 1928	17,374	831,877
Andorra	Semi-independent state under suzerainty of Bishop of Urgel and President of France	191	5,231
Austria	Republic	32,396	6,526,661
Belgium	Kingdom	11,752	7,539,568
Bulgaria	Kingdom (Tsar)	39,824	4,088,400
Czechoslovakia	Republic	54,191	13,611,349
Danzig	Free city. The League of Nations appoints a Commissioner	754	365,000
Denmark	Kingdom	16,004	3,434,555
Estonia	Republic	16,055	1,110,538
Finland	Republic	132,550	3,402,593
France	Republic	212,050	40,743,897
Germany	Federal Republic	182,213	62,410,619
Greece	Republic	41,033	4,204,684
Hungary	Kingdom ruled by a regent	35,875	7,980,144
Iceland	Kingdom	39,709	94,697
Italy	Kingdom	117,982	41,168,000
Latvia	Republic	24,440	1,885,870
Liechtenstein	Principality	65	10,716
Lithuania	Republic	59,033	2,293,100
Luxembourg	Grand Duchy	990	260,707
Monaco	Principality	8	22,956
Netherlands	Kingdom	12,582	7,086,913
Norway	Kingdom (including Spitsbergen)	149,064	2,650,775
Poland	Republic	149,359	27,192,674
Portugal	Republic (including Azores, &c.)	35,490	6,032,991
Romania	Kingdom	122,282	17,393,149
Russia	Soviet Republic	1,620,970	107,744,476
San Marino	Republic ruled by two regents	38	12,027
Spain	Republic (including Canaries, &c.)	194,800	21,658,222
Sweden	Kingdom	173,105	5,987,520
Switzerland	Federal Republic	15,975	3,880,320
Turkey	Republic	10,882	1,891,000
United Kingdom	Kingdom	93,720	46,047,046
Irish Free State	British Dominion	26,593	2,971,992
Gibraltar	British Crown Colony	2	20,038
Malta	British Colony possessing responsible government	118	223,741
Vatican City	Under sovereignty of Pope	108 acres	528
Yugoslavia	Kingdom	96,134	12,017,323

and there are several great peninsulas, Scandinavia and Jutland on the north, and Iberia, Italy, and the Balkan Peninsula on the south. The principal seas are the White Sea, the North Sea, the Baltic Sea, the Mediterranean Sea, the Adriatic Sea, the Aegean Sea, and the Caspian Sea; while the largest islands are Great Britain, Ireland, Iceland, Novaya Zemlya, the Danish Islands, the Balearic Islands, Corsica, Sardinia, Sicily, and Crete. The interior of the continent contains several great mountain masses, the chief of which is the Alps (q.v.) (Mont Blanc, 15,780 feet). Branching off and running through Italy are the Apennines (Monte Corno, 9541 feet), and in the Iberian Peninsula are the Pyrenees (La Maladetta, 11,165 feet) and the Sierra Nevada (Mulhacen, 11,703 feet). West of the Alps are the Cevennes, Jura, and Vosges; and north and north-east are the Harz Mountains and the ranges (Fichtelgebirge, Erzgebirge, and Böhmerwaldegebirge) which surround the Bohemian Plain. Farther east are the Carpathians, bounding the Hungarian Plain, while the Dinaric Alps and Balkan Mountains are in the Balkan Peninsula. There are three active volcanoes in Europe, Vesuvius in Italy, Etna in Sicily, and Hecla in Iceland. The *Great Plain* of North Europe occupies part of France, the west and north of Belgium, Holland, North Germany, and the greater part of Russia. Other plains are the Plain of Lombardy, renowned for its fertility, the Plain of Hungary, and the Iberian Plateau. See map on p. 34.

Of the largest European rivers the Rhine, Rhone, and Po rise in the Alps, while the Danube has its source in the Black Forest. The Volga, flowing to the Caspian Sea (which has no outlet), is the longest river in Europe, its length including windings being 2400 miles. Into the Mediterranean flow the Ebro, Rhone, and Po; into the Black Sea the Danube, Dnieper, Dniester, and Don; into the Atlantic the Guadalquivir, Guadiana, Tagus, and Loire; into the North Sea the Rhine and Elbe; into the Baltic the Oder and Vistula; and into the Arctic Ocean the Dvina. Most of those rivers are navigable, and the water-transport system, which includes the Rhine, the Danube and its tributaries and numerous connective canals, is of extreme importance to Central Europe. The lakes of Europe may

be divided into two groups: those which lie in the line of depression stretching from Sweden through Finland and Russia, and those which are situated in Switzerland and North Italy. In the northern group are Ladoga and Onega in Russia (the two greatest European lakes), while the Alpine lakes include Lucerne, Geneva, Constance, &c., north of the Alps, and Maggiore, Como, Garda, &c., to the south.

Europe lies almost entirely within the temperate zone. This fact, the great extent of its maritime boundaries, and the warm currents which prevent the formation of ice on many of its northern shores, give the continent a peculiarly genial climate. In the east extremes of temperature are greater than in the west. In the Mediterranean is a subtropical zone where such trees as the vine, olive, orange, fig, &c., flourish. North of this is the region characterized by the vine and the chestnut, and by wheat and maize. In this zone are the Alps, which on account of their elevation belong properly to the next zone, that of oak, beech, cereals, and cattle-rearing. In the most northerly region the fir and the birch are found, agriculture is of little importance, and the population is small. The only large wild animals of present-day Europe are the reindeer, polar bear, brown bear, wolf, wild ox, elk, stag, ibex, chamois, and saiga.

A broad, densely populated belt runs through England, across the sea to Belgium, South Holland, and the middle of Germany (Cologne, Dresden, &c.), and through Bohemia, Galicia, and Ukraine to the Don Valley. Within this lie the most important coal and manufacturing centres in Europe. A southern extension runs into Alsace-Lorraine. Other populous areas are either agricultural or, if industrial, are dependent upon an isolated coal-field (Rhone Valley), water-power (Switzerland), or imported coal (North-East Spain). The greater part of the population of Europe is engaged in agriculture, and the continent produces half the wheat of the world, two-thirds of the oats, three-quarters of the barley, a seventh of the maize, and almost all the rye. Half the world's sugar comes from beets grown in Europe, flax and hemp are found in Russia, Germany, and Ireland, and the Mediterranean lands produce a little tobacco and rice. The wheat belt is im-

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mediately north of the great population belt. North of this is found rye, and south maize. Oats grow mainly between rye and wheat, and barley with and south of wheat. The main European fisheries are in the North Sea and off the Norwegian coasts, where herring and cod abound. The Mediterranean tunny fishing is important.

The most important European coal-fields are within the area of dense population. Iron is also found here, but great quantities are produced in Spain and Sweden. Bauxite and gypsum are mined in France, graphite in Bavaria, copper in Germany and Spain, potash in Germany, mercury in Spain and Carniola, sulphur in Sicily, and tungsten ore in Portugal. Other mineral products are lead, gold (Ural Mountains), platinum (Ural Mountains), zinc, and petroleum (Romania and Galicia). See also *Geography*; *Geology*; *Ethnology*; and separate articles on the various constituent countries, &c.

The first authentic history of Europe begins in Greece at about 776 B.C. Greek civilization was at its most flourishing period about 430 B.C. After Greece came Rome, which by the early part of the Christian era had made vast conquests. Improved laws and superior arts of life spread with the Roman Empire throughout Europe, and the unity of government was also extremely favourable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the universal migration of the northern nations—Ostrogoths, Lombards, Franks, Visigoths, and Anglo-Saxons. Under Charlemagne (771–814) a great Germanic empire was established, and about the same time the Slavs founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyars appeared in Hungary; and the Normans founded kingdoms and principalities in England, France, Sicily, and the East. The Crusades and the growth of the Ottoman power are amongst the principal events which influenced Europe from the twelfth to the fifteenth century. The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onwards by the invention of printing and the Reformation. The dis-

covery of America was followed by the temporary preponderance of Spain in Europe, and next of France. Subsequently Prussia and Russia gradually increased in territory and strength. The French Revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. The most important events in European history from the Revolution of 1789 to 1914, the beginning of the European War, were: the establishment of the independence of Greece; the disappearance of Poland as a separate state; the unification of Italy under Victor Emmanuel; the Franco-German War, resulting in the consolidation of Germany into an empire under the leadership of Prussia; and the partial dismemberment of the Turkish Empire. The European War, 1914–1918 (q.v.), revolutionized the continent and altered the map of Europe. The chief results were the disintegration of the Dual Monarchy and of Russia, the abolition of the German Empire, and the institution of republican Governments in the smaller German states. The following new states were formed from parts of Russia, Germany, and Austria-Hungary: Estonia, Finland, Latvia, Lithuania, Czechoslovakia, Yugoslavia (including Serbia and Montenegro), and Poland. France regained Alsace and Lorraine, Turkey and Bulgaria lost much territory, and Belgium, Denmark, Greece, Italy, and Romania were all enlarged.—BIBLIOGRAPHY: G. G. Chisholm, *Europe* (Stanford's Compendium); E. A. Freeman, *General Sketch of European History*; A. Hassall, *A Brief Survey of European History*; A. D. Innes, *General Sketch of Political History*.

European War, The, 1914–1918.

1914

*Origins.*—The spark which set Europe ablaze in the summer of 1914 was the assassination at Sarajevo on 28th June of the Archduke Francis Ferdinand, heir-presumptive to the Austrian throne. Sarajevo was the capital of the Austrian province of Bosnia—once part of the ancient kingdom of Serbia, whose added size and strength as a result of the Balkan War of 1912–1913 was regarded in the Austrian Empire as an increasing source of danger to the Habsburg rule. Austria held Serbia responsible for the crime, and on 23rd



July sent her an ultimatum the terms of which were so harsh that Sir Edward Grey, afterwards Viscount Grey of Falldon, declared that he had never known one State address to another independent State a document of so formidable a character. All the evidence that has since come to light serves but to confirm the belief that more was intended by it than the mere humiliation of Serbia and the suppression of Slav intrigue.

Germany's war lords had seen in the assassination of the archduke an excuse for putting to the supreme test their long-prepared plans for world dominion. In spite of the propaganda assiduously circulated since the Peace of Versailles repudiating this charge, there is still little doubt that the brief weeks which intervened between the tragedy at Sarajevo and the outbreak of war were spent by Germany in stiffening the Austrian back and vigorously completing her own preparations for 'the Day' which had been the Pan-Germanic toast for years previously. It was of no avail that Serbia conceded every demand made by the Austrians—save two reservations safeguarding her independence, which she offered to submit to the Hague Tribunal. War was declared on Serbia by Austria-Hungary on 28th July; Belgrade was bombarded on the 30th; and events rushed to their inevitable end. Russia, the traditional protector of the Slavs, ordered on 30th July the mobilization of her southern armies in order, if necessary, to save Serbian independence. Germany at once sent an ultimatum to Russia threatening instant mobilization of her own army unless notified within twelve hours that Russia had stopped every measure of war. Russia replied that it was technically impossible to carry out such a demand in the time. On the following day (1st Aug.) Germany destroyed all hope of restricting the outbreak by declaring war on Russia.

Germany's challenge, as she well knew, would involve war also with Russia's ally, France, and her plans had long been made to meet this eventuality. Superior in organization and equipment to any other Power, she relied on being able to use this initial advantage against France with overwhelming effect before the masses of the Russian army, heavily handicapped by inadequate railway communications, could seriously affect the issue. In order to suc-

ceed, however, the blow had to be delivered with irresistible swiftness. It was too great a risk to rely upon an advance across the French frontier alone, with its protecting chain of fortresses and lines of defence works. The alternative was to launch the main attack through Belgium, advancing on Paris from the north-east, meantime holding the centre against a possible French advance, and afterwards swinging round her left through Lorraine in order to form, if possible, the second half of a pair of mighty pincers. On 2nd Aug., therefore, Germany sent a note to Belgium demanding safe passage for her armies through Belgian territory. Her troops entered Luxembourg on the same day and violated French territory—without declaration of war—at various points, the French having withdrawn all troops from the frontier in order to make it clear who were the aggressors.

On 3rd Aug., the day on which Germany formally declared war on France, the Belgian Government refused the German demands and appealed to Great Britain for assistance, Great Britain, as well as Prussia, France, Austria, and Russia, having signed the treaty of 1839 which had guaranteed the neutrality and independence of Belgium. This was the treaty which the German Chancellor, Bethmann-Hollweg, now repudiated as a mere "scrap of paper". The Belgian appeal and Germany's refusal of the British demand that the neutrality of that weak and peaceful nation should be respected united the whole British Empire on the question of intervention. Hitherto standing aloof as far as possible from European politics, Britain was not bound by any definite treaty to the Dual Alliance of France and Russia—still less to the other group of Powers, the Triple Alliance of Germany, Austria-Hungary, and Italy—but the moral obligation to intervene at once on Belgium's behalf was now clear. In any case, Britain could not have stood by and allowed France to be crushed by a Power which challenged British supremacy at sea, and regarded this country as standing everywhere in the way of its arrogant plans for dominating the world.

The invasion of Belgium, with its reckless disregard of treaty rights, thrust all doubts aside. At 11 p.m. on 4th Aug., receiving no reply to her demand that the neutrality of Belgium should be



respected, Britain declared war on Germany. Italy had decided to remain neutral on the grounds that since the war was one of aggression she was not called upon to range herself on the side of the Central Powers.

*Western Front.*—In planning her first tremendous blow with her right, Germany had reckoned not only without the additional opposition of Britain at such an early stage, but also without the stubborn defence of the Belgian army. Liège barred the way against the invaders for five critical days, the last fort being captured, with its gallant commander, Colonel Leman, on 15th Aug. On the 18th the *British Expeditionary Force*, under Field-Marshal Sir John French, completed its landing at Boulogne. Four days later it took the field on the exposed left flank of Lanrezac's Fifth French Army, which had been moved up into Belgium by Joffre to meet the Germans advancing from Liège. The *British Expeditionary Force*, all told, consisted of but six infantry divisions and one cavalry division; and Lord Kitchener, who had been appointed Secretary of State for War on 15th Aug., and foresaw the length of the struggle, called immediately for the First Hundred Thousand to form a new army. Meantime the British navy—the Grand Fleet of which had been placed under Sir John Jellicoe—had already secured the control of the seas, a control which, though threatened at times, remained undisputed to the end.

The full force of the staggering blow delivered by the German right wing took Joffre by surprise. Just as the Germans had underrated the moral effect throughout the world of their violation of Belgian neutrality, and of the reign of terror which they proceeded to impose upon the civil population wherever they advanced, so the French had underrated the strength which the enemy had succeeded in concentrating along the Western front. Here the Germans had mustered 84 divisions, no fewer than 52 of which were launched in the great advance through Belgium. Thus, though the Central Powers—comparing their fighting strength with the total available, but scattered forces of the Allies—were inferior in numbers, Germany was able to make her first supreme effort with a superiority at the decisive point of more than two to one. They risked every-

thing on this blow, defending their Eastern front against the Russians with only 10 divisions, and leaving their Austrian allies to deal with Serbia and the Southern Russian armies.

France had 84 divisions available, but 27 of these were reserve divisions which, unlike the German reserves, were not in the front line at the beginning of the war. The bulk of French troops had been massed for an offensive the first stage of which was to be an invasion of Germany by the armies on the right and in the centre of the line. It was not until 22nd Aug., by which date the French armies of the right and centre had everywhere been hurled back, and the real strength and significance of the German turning movement in Belgium made manifest, that General Joffre abandoned his original plan. Brussels had been occupied by the Germans on the 20th, and the Belgian command forced within the fortress lines of Antwerp. Namur was attacked on the 22nd, but Joffre, anticipating that it would hold out at least as long as the Liège forts, relied on stemming the incoming tide in Belgium by a counter-stroke at the German flank, thrusting Lanrezac's Fifth Army, with the British on its left, across the Sambre and Meuse, with the line Namur-Brussels-Antwerp as their objective. The British force, consisting at this time of four infantry divisions and one cavalry division, which had taken up positions through Binche and Mons, and along the canal to Condé, was making its final plans for this advance when the battle of Charleroi on the 22nd, forced by von Bülow's Second German Army before the Allies were in position, completely upset Joffre's calculations.

Lanrezac fought desperately to hold his ground before the sudden onrush of the German tide; and—unaware of the approach of another German army, the Third, under von Hausen—hoped to retrieve the situation by a blow on von Bülow's right from the British. Sir John French, however, had learned meantime not only that Namur was falling and that the retreat of the Fifth French Army had left the British right flank in the air, but that instead of being himself faced, as he had been led to believe, by three or four German divisions at the most, he had opposed to him the whole of von Kluck's First German Army. He

had been fighting six German divisions since the morning, and though losing little more than his outpost line against odds, was obviously unable either to go to Lanrezac's help—knowing as he now did that seven other German divisions were advancing against him and threatening to outflank his left—or make a prolonged defence of his own position. He agreed, however, to maintain his ground for twenty-four hours, and, outnumbered though he now was by two to one, fulfilled this pledge. But for the dogged endurance of the British army at this juncture, and the skill and courage with which the subsequent retreat was carried out, the French left must surely have been enveloped and the piecemeal disorganization begun of the whole French line.

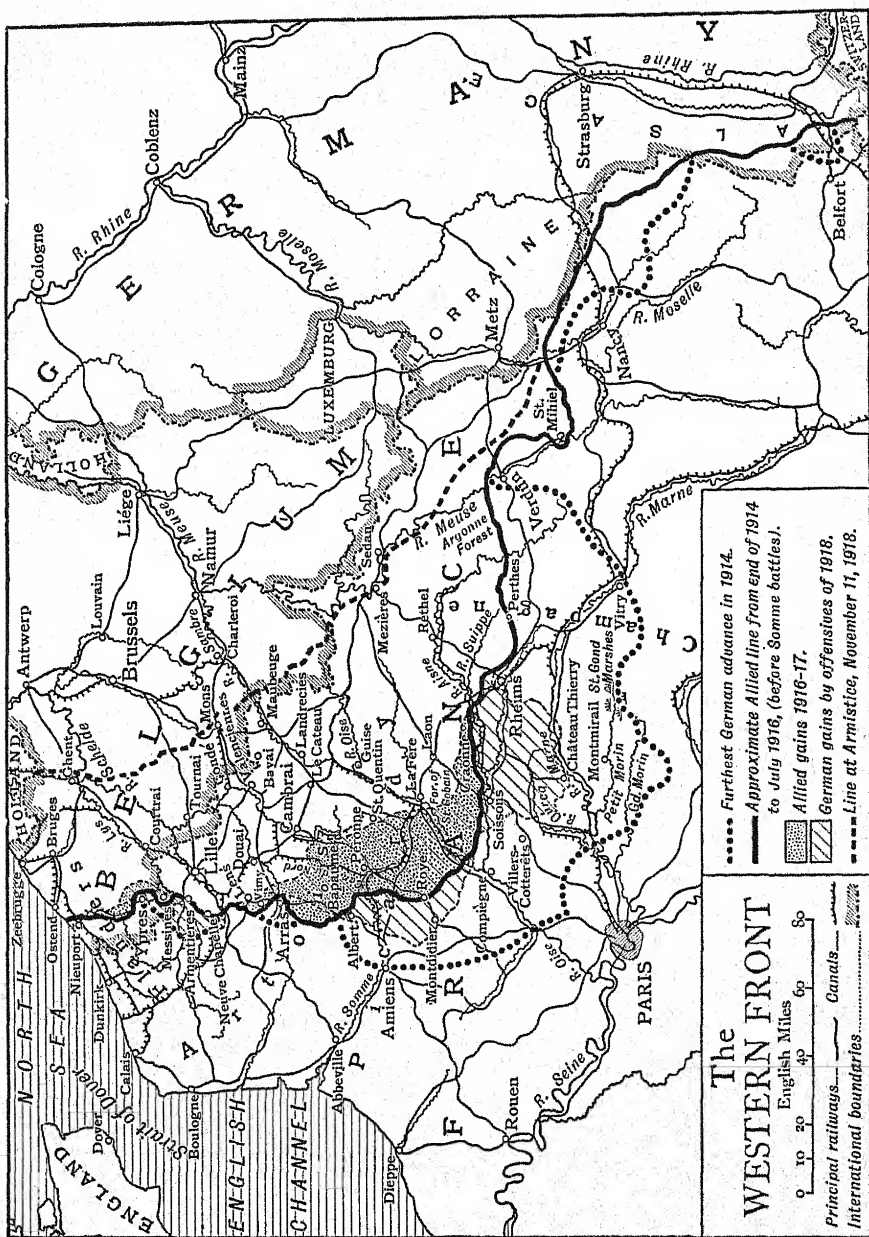
24th Aug., 1914, found the Battles of the Frontiers everywhere ending in the enemy's favour. Realizing that his original plan had failed, Joffre took immediate steps to initiate a new one. Ordering the First and Second Armies on his right to cover Belfort and Nancy, and pivoting his line on Verdun, he swung back his left and centre, hoping thus to make a stand on the Somme. With that end in view he created a new army unknown to the Germans—the Sixth, under Maunoury—which, hurriedly made up of troops collected from various parts of the line, was intended to strike back on the threatened left wing. The rapidity of the German advance, however, rendered a stand on the Somme out of the question. The enemy was there before Maunoury's army was ready. A further retreat was therefore ordered until Joffre could deliver the full weight of his counter-offensive.

Meantime the Fifth French Army and the British on its left had escaped the clutches of von Bülow, von Hausen, and von Kluck only by superhuman efforts. The great retreat from Mons was begun soon after dawn on 24th Aug. by a feint attack by the 1st Corps under Haig on the right, under cover of which Smith-Dorrien's 2nd Corps withdrew 5 miles, and then held its ground while the 1st Corps followed suit. Hard pressed though they were, Haig's troops had reached the line between Maubeuge and Bavai by the following afternoon, Smith-Dorrien's corps extending the line thence to Bry. They were still a day's march behind Lanrezac's retreating army, and though the

protection of the Maubeuge fortress—where the French were still holding out—was a sore temptation to risk a stand there, Sir John French wisely ordered a further retreat that day to the line Le Cateau-Cambrai. Here von Kluck's exultant troops, who had dogged their footsteps throughout, were sent in at night to overwhelm the two exhausted British corps, now separated from each other by a gap of 7 miles, a gap which half of the cavalry division under Allenby endeavoured to fill. Two French reserve divisions came to the assistance of Haig's corps at Maroilles, and the Guards Brigade shattered the attack at Landrecies.

The brunt of von Kluck's assault fell on Smith-Dorrien's corps at Le Cateau after the troops had been marching stubbornly all day. In Smith-Dorrien's view he had no option but to stand and fight. Sir John French, though full of praise at the time, afterwards blamed him for not resuming the retreat at daybreak. On the other hand, it is argued for Smith-Dorrien that he was fully justified by results; that the magnificent stand which he made at Le Cateau checked the German pursuit just in time, and prevented the envelopment of the Allied left which the Germans had all but completed. It was only after losing some 8000 officers and men that the devoted 2nd Corps broke off the action to continue the interrupted retreat before it was too late. Von Kluck, whose own losses had been so heavy that his plans were obviously thrown out of order, failed to prevent its escape. On the following day the two British corps, having gradually closed the gap which divided them, rejoined forces and continued the retreat, helped on the 29th by a timely counter-stroke at Guise by Lanrezac's Fifth Army which temporarily checked the German advance. Two days later the Guards struck back at Villers-Cotterets, but neither the French nor the British troops were yet in a position to make a real stand.

Alarmed for the safety of the capital, the French Government took the precaution of removing to Bordeaux two days before the great retreat came to an end. By this time Joffre had attained security on his right and gradually increased his strength as his army retired on its reserves. Besides Maunoury's Sixth Army, which was moving back on the



**The WESTERN FRONT**

0 20 40 60 80  
English Miles

Principal railways... Canals

International boundaries.....

..... Furthest German advance in 1914.  
 — Approximate Allied line from end of 1914 to July 1916, (before Somme battles).  
 [Stippled Area] Allied gains 1917-17.  
 [Hatched Area] German gains by offensives of 1918.  
 - - - - - Line at Armistice, November 11, 1918.

left flank in readiness to spring at the Germans when Joffre gave the order for his counter-stroke, another new French army, the Ninth, under Foch, emerged behind the marshes of St. Gond, filling the gap between the Fifth and Fourth Armies behind Vitry. On the right the battle-line was continued by the Third Army under Sarrail, and thence by Castelnau's Second Army, which had stemmed the German tide in the stubborn struggle for the Grand Couronné de Nancy.

Much-needed help was given by the Russians at this critical hour by their campaign in East Prussia (see p. 42). Their sweeping successes took the German Higher Command by surprise, and in its sudden fears for safety on this front, von Moltke withdrew a reserve corps from the German right wing in France—where he considered the opposition broken beyond repair—and transferred it with another corps to the Eastern front.

German cavalry patrols had, indeed, already advanced to within a few miles of Paris before Joffre issued the orders for his great counter-attack. Regarding the British army as practically out of action, and unaware of the danger threatened by Maunoury's Sixth Army—increasing every hour as reinforcements were flung into it for the defence of the capital—von Kluck had crossed the Marne with practically the whole of his army.

In this headstrong passage he had acted against the orders of the Higher Command and left his flank exposed. Gallieni, Governor of Paris, saw the opportunity, and Joffre seized it. The prelude to the critical battle, therefore, was Maunoury's march on the Ourcq on 5th Sept. with the newly-created Sixth Army. The Ourcq flows down to the Marne at this point, and Maunoury's task was to get into position for a surprise attack on the following morning. The German flank-guard, however, discovered this movement, and von Kluck, his eyes now opened to the significance of the forces gathering against him, took immediate steps to check it. Two of his corps were withdrawn across the Marne in the hope of crushing the oncoming Maunoury on their right while the British and the French Fifth Army—the Fifth now under General Franchet d'Esperey—were kept in check by strong rear-guards and cavalry, and such help as von Bülow could render on

von Kluck's left. It was a manoeuvre which all but succeeded in frustrating Joffre's plan. Instead of taking von Kluck by surprise on the 6th, Maunoury had desperately to fight for his life against unexpected odds. The struggle lasted for days at this vital point.

Maunoury stood his ground with heroic endurance until he was at the limit of his strength and resources, and was being driven back. The issue was decided partly by the reinforcements which Gallieni hurried up from Paris in motor-buses and taxis, but more particularly by the increasing threat on von Kluck's left, where the tide of battle had already begun to turn. The British army, now reinforced by the 4th Division, which, with the 19th Infantry Brigade, became the Third Army Corps under General Pulteney, had carried Coulommiers on the night of the 6th, thus also helping the French Fifth Army, on its right, in its advance on Montmirail. Farther to the right the French Ninth Army, under Foch, opposing von Bülow in the marshes of St. Gond, was only awaiting its opportunity to spring back with a smashing attack at the German centre.

On 8th Sept. the British were across the Petit Morin, while the French Fifth Army was driving von Bülow's right through Montmirail and, by nightfall, following them on the road to Château-Thierry. Von Kluck realized then that his great enveloping plan had failed. Though hard pressed, Maunoury was still disputing every yard, "fighting", as Joffre afterwards said, "beyond the limit of human endurance"; and it was obvious to von Kluck that to expend his strength further with his right was to court disaster on his left. Here the Franco-British advance was already threatening to cut him off from von Bülow, whose right flank had begun to retire before the vigorous attack of the French Fifth Army.

Foiled in this direction, the German Higher Command made one last effort to break through the French line in the centre, but both von Bülow's troops and von Hausen's on their left were weakening under the fierce resistance of Foch and Langle de Cary. Though battered and bent to the last extremity, the French centre held together. The same heroic story was continued on the right by Sarrail in his defence of Verdun, and by



de Castelnau at Nancy. The invaders, themselves on the verge of exhaustion, had shot their bolt. With their right wing already in full retirement, a general retreat was ordered on the 10th of all the five German armies.

It was only just in time. 11th Sept. found the enemy in full flight, his grandiose plan of capturing Paris and bringing France to her knees by one brief stupendous campaign abandoned. By the 12th he was 65 miles back from the Seine, after being so near to the capital that his agents had notified the American Ambassador that he was nearing the gates and about to take possession.

The triumphant hopes raised among the Allies by this dramatic turn of fortune, however, proved equally illusory. The enemy's retreat, though general, was not a disorderly rout. His first defeat on the Marne was one of the decisive battles of history, but it did not lead to the collapse which it was confidently hoped before the end of September would follow the reaction. Keeping the Allied troops at bay as they followed in pursuit, the Germans retired to prepared positions on the Aisne—positions of great natural strength commanding all the approaches to the river. Von Moltke had now been removed from his position as Chief of the German General Staff and succeeded by von Falkenhayn.

When the first battle of the Aisne opened on 13th Sept., the Allies were under the impression that they had only delaying tactics to deal with; that the main German army was still in retreat. They were wholly unaware how impregnable were the new positions which the Germans had fortified against the old form of frontal attack. The first battle lasted not more than six days, but the struggle for the Aisne was to drag on into months, until both sides had extended their front from the sea to the Swiss frontier.

At the opening of this battle the British army, with Maunoury's troops on the left from Compiègne to Soissons, had a front of 15 miles, extending from Soissons eastward to Pont-Arcy. Throwing bridges across the flooded river under heavy artillery fire, the British divisions crossed the slopes on the opposite side. Here the enemy's entrenched positions, and superiority in artillery, proved so formidable and inflicted such heavy losses that the

British troops were forced to dig themselves in. Maunoury's Sixth French Army on their left, after carrying the line of the river and neighbouring slopes, was similarly held up by the main German defences on the plateau. D'Esperey's Fifth Army, on the British right, had much the same experience on the Craonne plateau; farther east Foch's Ninth Army was finding it impossible to cross the Suippe after following the Germans through Rheims; while Langle de Cary's advance with the Fourth Army had been held up in Champagne.

Powerful counter-attacks by the enemy on the 15th recovered some of the ground thus dearly won on the Aisne, and it became clear to Joffre that he could no longer hope to carry these positions by frontal attack. As the battle swayed backwards and forwards the French Generalissimo sought to outflank the German right by extending the Allied left with two newly-created armies—the Seventh, commanded by de Castelnau, whose Second Army was transferred to Dubail, and the Tenth, entrusted to Maud'huy. De Castelnau extended the French line through Roye to Albert, whence it was continued by Maud'huy through Arras to Lens. The new strategy was, however, promptly countered by Falkenhayn, who strove in turn to outflank the French by extending his line on the right of von Kluck.

While this outflanking race was developing between the Aisne and the sea, the enemy strove to recover the offensive in the other direction, first by a series of onslaughts to the south of Verdun, which only resulted (on 23rd Sept.) in the creation of the St. Mihiel salient—a threatening pocket in the line which remained there until the closing campaign of 1918—and then by the German Crown Prince's attack on Sarraill's centre in the forest of the Argonne. The Crown Prince's offensive proved a costly failure. Here, on both sides, the line between the Alps and Rheims—where the cathedral suffered irreparable damage from German shells after the failure of these attacks—became stabilized; and, save for slight variations in the course of the struggle, remained practically unaltered until the end of the war.

At the other end of the line the race to the coast was taken up by the British army, which, at Sir John French's sug-



gestion, was now transported from the Aisne to Flanders, where it was nearer its base, and sorely needed to protect the Channel ports. The 7th British Division had meantime landed at Ostend and Zeebrugge, and the Naval Division had been dispatched to Antwerp to assist the isolated Belgian army in the defence of that city. Though isolated, the Belgians had not remained inactive at Antwerp. Their sorties during the critical weeks of the German advance on Paris had diverted against them troops which had been desperately needed on the Marne. With the line practically established in France, the Germans brought against the defences of Antwerp their 28-cm. howitzers, which far outranged any guns with which the Belgians could reply. The two British Naval Brigades and a brigade of Marines were sent up as a forlorn hope to help in the defence, and Mr. Winston Churchill, then First Lord of the Admiralty, followed on their heels; but the fall of the city was inevitable. The bombardment ceased on 9th Oct., and the Germans made their formal entry on the following day. Most of the Belgian army escaped along the coast—just in time; to hold the strip of Belgian soil which formed in due course the extreme left of 'Joffre's Wall' in the West. The British force at Antwerp, which helped both in the flight of the citizens and the retreat of the Belgian army, lost heavily, some 1500 of the Royal Naval Division being forced across the Dutch frontier and interned, and about 800 captured by the enemy.

The final retreat of the Belgian army was covered by Rawlinson's division, which had been landed for the defence of Zeebrugge and Ostend, and now had to fight its way to join the main British army at Ypres. Here Sir John French's force, safely transported from the Aisne, had taken up its position on the left of Maud'huy's corps, and was also joined by the Indian contingent under Willcocks. The first battle of Ypres, when the Germans made their fresh attempt to destroy the British army and seize the Channel ports, followed their failure to outflank the Allies by marching along the Belgian coast. British monitors outranged their guns in this sector, and the Franco-Belgian line, which held the sector from Dixmude to the sea, flooded the low-lying fields by opening the dikes. Thereupon the Ger-

mans massed in enormous numbers for a compensating stroke against the Allied line round Ypres, where French's first offensive in this field had just been nipped in the bud.

Space forbids a detailed account of the series of epic struggles which followed. The flower of the British army which had survived the retreat from Mons and the battle of the Marne fell in holding the line against the repeated assaults of the enemy. By the 30th, repeatedly reinforced with fresh troops, the Germans outnumbered the British by four to one, and the issue long hung in the balance. "October 31st and November 1st will remain for ever memorable in the history of our country," Lord Ypres afterwards wrote in his story of 1914, "for during those two days no more than one thin and straggling line of French and British soldiers stood between the Empire and its practical ruin as an independent first-class Power." The hour of greatest danger passed when Brigadier-General Fitz-Clarence, V.C., commanding the Guards Brigade of the 1st Division, on his own initiative called on the 2nd Worcesters, who were in reserve, to fill the gap at Gheluvelt which the Germans at long last had succeeded, on 31st Oct., in making after repeated attacks along the Menin road to Ypres. How gallantly the Worcesters responded—flinging back the advancing Germans and holding the broken line until it could be reconstructed—is now a matter of history. French reinforcements from the armies placed under the direction of General Foch arrived on the following day and enabled our line to hold. Other French troops were sent up as fast as General Foch could spare them. Finally, after three more weeks of exhausting effort, when the Flanders mud called a halt in the struggle for the channel ports, the exhausted British troops were released all along the line on 22nd Nov.; and the whole Western front became more or less stabilized for the winter.

*Eastern Front.*—Reference has already been made to the invaluable services rendered by the unexpected advance of the Russians across the East Prussian border during the crisis of the dash towards Paris. The Grand Duke Nicholas, who was in supreme command of the Russian forces, ordered the invasion of East Prussia by the armies under Generals

Rennenkampf and Samsonoff as early as 7th Aug. Before the end of the month the Russians had captured Königsberg, Insterburg, Allenstein, Soldau, and threatened soon to have all East Prussia within their grasp. Hence the hurried withdrawal of troops from the Western front to help General Hindenburg, a veteran of the Franco-Prussian War, who was called up from the retired list to save the situation. Hindenburg, who was given General von Ludendorff as his Chief of Staff, knew every foot of East Prussia where the Russians were advancing. Collecting a fresh army of 160,000 from every available source—the reinforcements from the West were not yet available—he waited until the two invading armies had lost touch with each other among the treacherous Masurian marshes, and then, concentrating his strength on Samsonoff, delivered the sudden blow on 28th Aug. which turned what had hitherto been a dazzling triumph into a crushing disaster. The battle of Tannenberg, as the victors named it, cost the Russians some 30,000 in killed and wounded (including General Samsonoff, who was among the killed) and 90,000 in prisoners. Rennenkampf made a rapid retreat to the Niemen, where General Ruzsky, who had been sent by the Grand Duke Nicholas to retrieve the situation, succeeded in checking the victorious advance of Hindenburg on the heels of the retreating Russians. Much of the advantage which Hindenburg had won at Tannenberg was rashly thrown away in the operations which ended in the failure of the Germans to cross the Niemen—some 200 yards wide at this point—and their costly defeat after a nineteen days' battle at Augustovo in October.

Before he had time to restore the situation, Hindenburg was called south to undertake the first advance of the Central Powers on Warsaw, designed to save the Austrians, who, while the Russian right wing was marching to its doom in East Prussia, were being driven back in Galicia in a series of battles which gave the Russians in the south possession of Lemberg and all Eastern Galicia. This was General Ruzsky's achievement in the opening campaign, before he was transferred to the shattered right wing on the Niemen. Brussiloff, on his left, after capturing Tarnopol and Halicz, had swept on towards the Carpathian passes. Only

Przemysl, now invested by the victorious Russians, held out in Galicia, while Ivanoff in Poland had hurled the Austrians, under Dankl and the Archduke Joseph Ferdinand back beyond the Vistula. With the key position of Cracow thus seriously threatened, there was urgent need for a German blow to check the Russian advance. Hence Hindenburg's march on Warsaw, designed by Ludendorff as a blow at the Russian centre to keep pace with a counter-offensive by the Austro-Hungarians in the south, which was intended both to relieve Przemysl and recover Lemberg.

With their combined forces—placed under Hindenburg's supreme command—and amounting in all to some two million men, the Central Powers both outnumbered and outgunned the Russians; but the Grand Duke Nicholas, foreseeing the danger, took immediate steps to avert it. The advance on Cracow was abandoned, and the Russian army involved in that campaign withdrawn behind the Vistula and the Save. This manoeuvre succeeded in its purpose of persuading the Germans into the belief that the Grand Duke proposed to abandon the Polish salient and retire on Brest Litovsk. In reality his intention was to counter-attack in defence of Warsaw with an army from the north-west under Rennenkampf, covered by the guns of Novo Georgievsk; while Ruzsky was given command of the defence of Josefov, where the Germans hoped to cross the Vistula and so take Warsaw in the rear. The Grand Duke's strategy was completely successful. Rennenkampf's counter-attack from the north-west threw Hindenburg's left wing into disorder and threatened his centre before Warsaw, while Ruzsky, to the south, after luring the Germans across the river, fell on them with the bayonet until not a German escaped. Ruzsky followed up his advantage by crossing the river lower down, at Novo Alexandriev, and driving the Germans back to Radom on 25th, and from Kielce (3rd Nov.). Endangered on both flanks, the German centre had no alternative but to beat a hasty retreat, finally recrossing their own frontier to plan a second attempt. While Hindenburg was thus failing at Warsaw his Austrian subordinates, curiously enough, were winning the only successes which fell to the credit of the Allied Powers during this

combined advance. Przemysl was relieved and Jaroslaw recovered, according to plan; but Hindenburg's retreat from Warsaw compelled the Austrians also to fall back in Galicia. Przemysl was reinvested, and the Russian march on Cracow resumed.

The Russians were approaching this coveted gateway both to Berlin and Vienna when Hindenburg was making his second and more desperate advance on Warsaw. Mackensen delivered the main assault on 18th Nov. on the line held by Ruzsky from Gombin, on the Vistula, to the Warta. In its weight and impetuosity it carried at first everything before it; but the wedge which it made in Ruzsky's centre was not wide enough. The broken sides held fast, and Ruzsky presently began to close them up. But for the delay in the arrival of reinforcements sent by Rennenkampf at Ruzsky's request the German triumph would soon have turned to dramatic disaster. As it was, only the remnants of the two German army corps succeeded in fighting their way back. Hindenburg, however, sent up heavy reinforcements, and in face of his obvious determination to carry Warsaw at all costs the Grand Duke Nicholas straightened his line by evacuating Lodz, and defended the Polish capital from behind the Rawka and the Bzura. Three weeks of terrific fighting followed, but with little advantage to the Germans. They were still 35 miles from Warsaw when the year 1914 came to an end. The Central Powers were again more successful with the Austro-Hungarian part of this closing campaign of the year on the Eastern front. Although the Russians had reached as far as the gates of Cracow by 5th Dec., they were obliged to fall back in face of the Austro-Hungarian counter-offensive. With the loss of the Dukla Pass a week later came a general Russian retreat on this front, though they retained possession of the Carpathians.

*The Balkans.*—Ebb and flow had also marked the course of the opening campaigns in Serbia. The second-line troops which Austria used in her first punitive expedition, following her bombardment of Belgrade on 29th July, were no match for heroic troops fighting for their own soil. Before the end of August the invaders had been driven back across the Drina with heavy losses, and Serbia, together

with Montenegro, who had thrown in her lot with the Allies, proceeded to carry the war into Bosnia. These galling operations drove the Austrians to a fresh but equally inconclusive offensive. They were too deeply engaged on the Russian front to return to the attack in earnest until towards the beginning of November, when Turkey, after underground preparations for war engineered by Germany, openly declared herself on the side of the Central Powers. The fresh invasion of Serbia, carried out by an army corps advancing in three columns, began with a series of spectacular successes, Valjevo falling on 29th Nov. and Belgrade ten days later, but proved even more calamitous to Austrian arms than the earlier attempts. Under the able leadership of the Serbian Crown Prince, Marshal Putnik, and General Mishitch, the Serbians—veterans most of them of years of Balkan warfare—fell back only to turn on the invaders on 3rd Dec. in the battle of Rudnik, or 'Battle of the Ridges' as it came to be called, with such fury that the Austrians broke in all directions. A whole field army was practically wiped out. At the end of three days only the remnants succeeded in crossing the Danube, the Drina, and the Save, leaving behind them the bulk of their guns and some 80,000 casualties. The capital was retaken on the 15th, and Serbia, for the time being, was left severely alone.

#### 1915

*Eastern Front.*—The early months of 1915 were devoted by the German Higher Command to preparing a colossal effort against Russia. Since her scheme of immediate conquest in the West had failed, it was necessary to deal Russia a crushing blow, not only to enable Germany to concentrate against the Franco-British armies, but also to show the hesitating Balkan states on which side it behoved them to throw in their lot. Russia opened the campaigning season with a series of brilliant but illusory successes. She checked two further attacks on Warsaw by Hindenburg, one in February and the other in March; she captured Przemysl on 22nd March, with 126,000 Austrian prisoners and 1000 guns, subsequently overrunning the whole of Eastern Galicia, and winning along a front of 70 miles all the passes

which led through the Carpathians into the Plains of Hungary.

These triumphs, however, were negligible when compared with the blow which Mackensen was presently to deliver against the Dunajec front with 2,000,000 men fully equipped with poison gas, liquid fire, and other munitions of modern warfare, including an immense number of guns. The Dunajec front was held by Dmitrieff's Russian army, against whose fortified and entrenched positions a vast volume of high explosive shells suddenly burst on 1st May, to be followed by waves of poison gas before the shock troops advanced to carry the shattered line. Ill-equipped and hopelessly outnumbered, the Russians could make no effective resistance. On the following day Dmitrieff's army was in full retreat. Heroic stands were made at the Wisloka and elsewhere, but no available troops could stand for long against Mackensen's tremendous force. By the middle of the month the Russians were back across the San. The rest of their spectacular gains in Galicia had to be sacrificed as well: first the Carpathian passes; then Przemyśl, which the Austro-Hungarians recaptured on 2nd June; and Lemberg (22nd June); followed by the loss of the Dniester line as far as Halicz. By the end of June they were forced to beat a further retreat before Mackensen's irresistible advance towards the Lublin-Cholm railway.

The reconquest of Galicia was but the prelude to the main part of the German plan for the complete downfall of Russia in 1915. Heavier blows were to follow during the next three months. Mackensen's advance was accompanied by a similar movement in Poland, where the main Russian forces were concentrated. Prasnysz was captured on 14th July, the Russians retreating to the great line of fortresses on the Narew guarding Warsaw from the north-east. With Mackensen still advancing in the south Warsaw was doomed. It fell on 4th August. Ivanogorod, to the south, followed suit on the 5th; Kovno, in the north, on the 17th; Novo Georgievsk two days later; Brest Litovsk on the 25th.

The third part of the plan for completing the Russian defeat was an advance in the extreme north, where German naval guns were ordered to share in von Below's operations along the Riga coast with the

object of turning the line of the Dvina as far as Dvinsk and cutting off the main Russian armies from direct communication with Petrograd. An attempt to carry Riga was frustrated by the Russian fleet, which arrived in time to annihilate the landing forces and disperse the German ships with a loss of two cruisers and eight torpedo-boats. This set-back, however, did little to stem the tide of German successes on land. Mackensen, having driven the Russians from Lublin and Cholm and across the Bug, swept on towards Pinsk, which he occupied on 16th Sept., Lutsk in the meantime having been entered by Boehm-Ermolli on 1st Sept., and Brody by the Austrians at the same time.

Everything now turned on the vital blow which von Below was delivering on the extreme German left with the object of carrying Riga and turning the line of the Dvina. Von Below's left failed in a furious attempt to cross the river at Friedrichstadt, and the critical point shifted towards Vilna, the fate of which was decided on 12th Sept. after a ten days' battle at the village of Meiszagowla, some 15 miles away. Forced at length to accept defeat under the overpowering weight of German artillery, the retreating Vilna armies were in grave danger of being cut off by masses of German cavalry sent by Hindenburg to complete their discomfiture.

A week previously the Grand Duke Nicholas had been transferred to the command in the Caucasus, the Tsar himself taking over the supreme command of the Russian armies, with Alexieff as Chief of Staff. Another change which had far-reaching and immediate results was the return of Ruzsky—recovered from an illness—to his command in the northern theatre of war, where the retreating Vilna armies now seemed likely to be caught in Marshal Hindenburg's enveloping movement. With reinforcements hurried up in the nick of time Ruzsky launched a counter-offensive from Dvinsk, which not only saved the retreating armies but also recovered a certain amount of lost ground. Counter-attacks were also delivered in the south, where Ivanoff advanced on Rovno, and Brussiloff and Lechitsky on the Sereth. Taken by surprise, the Austro-Germans lost both Lutsk and Dubno to Ivanoff, and farther south by the end of the month were pushed back to the



Sereth. A limit had been put to the enemy's triumph in time. All Hindenburg's renewed efforts failed to secure Riga and Dvinsk before winter set in. Both here and elsewhere on the Eastern front the line did not materially change during the remainder of the year.

*The Balkans.*—By this terrific campaign, which cost Russia some two million men, and carried the war far into her own country—besides sowing the seeds of intrigue and revolt which were destined to yield their sanguinary harvest two years later—Germany persuaded Bulgaria that it was time to join forces with the Central Powers. She was promised tempting additions of territory, including the whole of Macedonia possessed by Serbia. When, therefore, the main offensive against the Russians died down and a new Mackensen 'drive' was organized against Serbia, Bulgaria promised to join in at the critical moment by stabbing her neighbour in the back. Against such a combination of forces Serbia was powerless to save herself; and her allies were too desperately engaged elsewhere to go to her rescue before it was too late. Greece was bound by treaty to stand by her if attacked by Bulgaria, but her sovereign, King Constantine, repudiated his bond, though repeatedly urged to honour it by his Prime Minister, Venizelos.

The invasion of Serbia by the Austro-German armies began on 6th Oct., 1915. Belgrade was occupied on the 9th, and two days later the Bulgarians crossed the frontier to take the Serbians in the rear. There was nothing left for the Serbian troops but to retreat, which they did, fighting heroically a series of stubborn rear-guard actions. It was not until 14th Oct. that a Franco-British force under General Sarraill, newly landed at Salonika, was able to start up the Vardar Valley in the direction of their hard-pressed allies. The British column, under General Mahon, advanced on the right towards Lake Doiran; the French towards Strumnitza. They were too late. The Serbian army, after losing 50,000 men in its great retreat, only avoided the net with which Mackensen and the Bulgarians had hoped to encircle it by a hazardous flight across the frontier and over the mountains of Albania and Montenegro to the Adriatic. The triumphant Bulgarians turned their main forces against the Franco-British

columns, now preparing—the object of their advance no longer existing—to return to their base. Heavy attacks were launched with the object of harrying the retreat and separating the two columns. On 6th to 7th Dec. the British force, while holding the front towards Lake Doiran, met with 1300 casualties in defeating the most determined of these onslaughts. By 13th Dec., however, both columns had succeeded in crossing the Greek frontier, where a powerful position was fortified, securing the Allied base at Salonika.

Montenegro was abandoned to the Central Powers without resistance as soon as the conquest of Serbia was assured, King Nicholas seeking refuge in Paris.

*Italian Front.*—One compensating advantage in this dark year of 1915 was the intervention of Italy on the side of the Allies. Austrian bribes to secure her agreement to the conquest of Serbia were declined as inadequate. Italy signed instead the Treaty of London—under which the Allies promised to satisfy most of the territorial claims which she sought in the Trentino and across the Adriatic to complete Italian unity—and declared war on Austria-Hungary on 23rd May, 1915. Hampered by lack of heavy artillery and other modern munitions of war, as well as by a mountainous frontier which gave every advantage of position to the enemy, she was unable to divert the Central Powers from their devastating path on the Russian and Balkan fronts. She captured three of the passes on the east side of the Trentino as preliminary moves to a larger plan of operations, which aimed at an advance across the Isonzo with her ultimate goal at Trieste, but the advance fell far short of this objective. Before the end of the summer General Cadorna, the Italian Commander-in-Chief, had carried the west bank of the Isonzo from Tolmino down to the sea, and secured a number of further gains of minor importance in the Trentino, but could maintain little more than a foothold on the Carso. Gorizia, which barred the road to Trieste, was not destined to fall for another year.

*Western Front.*—With her heavy commitments on the Eastern front, Germany, who was well aware how matters stood with the Allies in the matter of munitions, left the main offensive in the West to be delivered by the Franco-British armies.



The first success fell to the French on 8th Jan., when they recaptured Perthes, but failed to straighten out the St. Mihiel salient. The French also opened the year with a fresh advance in Alsace, the Germans responding on 9th Jan. by bombarding Soissons, including the cathedral, and following this up with a furious attack which won them a bridge-head on the Aisne.

Most of the Allies' operations on the Western front during the next eight months were based on Joffre's plan for a great offensive in the autumn. The battle of Neuve Chapelle, launched by the British Commander-in-Chief on 10th March, was intended partly as practice for the coming grand attack. Sir John French had accumulated a reserve of ammunition for the purpose of testing the new artillery tactics on a comparatively big scale. The preliminary bombardment which preceded the advance of Rawlinson's Fourth Army in this battle, with the Indian Corps on the right, consumed more shells than were used in a whole year of the South African War. The British and Indian troops following in its wake quickly occupied the ruins of Neuve Chapelle, advancing 1000 yards on a 3-mile front. To left and right, however, deadly defences in the enemy's positions had escaped the shells. Nests of German machine-guns, and unbroken barbed-wire entanglements, together with faulty staff work, held up the attack at these points, and lack of ammunition prevented the British Commander-in-Chief from repeating the first artillery effort. He had straightened out his sagging line at this point, and created a dent in the German line, but it had been a costly gain. The renewed attacks and counter-attacks which followed during the next few days effected little material change in the situation, and the ground finally won was consolidated.

The next outstanding move on the British front—after a German attack at St. Eloi, 15 miles north of Neuve Chapelle on the 14th, in which Princess Patricia's Canadian Light Infantry first made their mark—was the determined bid for Hill 60, south-east of Ypres. This important gun position was mined and captured on 22nd April; lost again to the enemy in counter-attack; and then, after five days' incessant fighting, recaptured and held by the British.

The struggle for Hill 60 was followed immediately by the first poison-gas attack on the Western front—launched by the Germans north-east of Ypres, where the line was held by French Colonial and Territorial troops, with the Canadian Division on their right. Wholly unprepared for this appalling development of warfare, after two days' artillery bombardment, the French troops, many of whom fell asphyxiated as the gas clouds rolled over their trenches, broke and fled. The Canadians, less affected by the gas than their neighbours, found their left flank unprotected and a perilous gap 5 miles wide. Rising nobly to the occasion, the Canadians played a lion's part in attempting to fill the breach until Allied reinforcements could arrive on the scene. The situation was saved after several days of the fiercest fighting, but the Germans had brought their line 2 miles nearer to Ypres and in a better position to maintain intense pressure on the British troops in that sanguinary salient.

It was to relieve this pressure, as well as to support Joffre's new offensive in the direction of Lens and Lille, that the British Commander-in-Chief began the battle of Festubert on 9th May. The British attack on this occasion was launched between Givenchy and Rougebanc, the French simultaneously advancing between Neuville St. Vaast and Notré Dame de Lorette with the object of storming the Vimy Ridge. Better equipped with guns and high explosives, the French scored the greater initial success, but carried the enemy's first lines only to be faced by impregnable strongholds like the Labyrinth. The Vimy Ridge remained unconquered for another two years. On the left the British, after the first attack had broken down through insufficient artillery preparation, captured the enemy's trenches on a front of 3000 yards; but the Aubers Ridge still barred the road to Lille. The disastrous losses incurred in this heroic struggle, through lack of adequate supplies of shells and guns, led to the formation of the Coalition Government, with Mr. Lloyd George as Minister of Munitions.

The spring of 1915 also brought the first of 'Kitchener's Men' into action on the Western front. The advance guard of the New Army won its spurs in the *flammenwerfer*, or liquid-fire attack,

launched for the first time against the British lines at Hooge, in the centre of the Ypres salient. Blinded by this latest addition to German frightfulness, the new units lost the first-line trenches, but covered themselves with glory in preventing further disaster; and were avenged on 9th Aug., when the 6th Division won back all and more than the lost positions.

The summer brought little respite from the war of attrition until the time arrived for Joffre's combined offensive in September, by means of which the French Generalissimo hoped not only to drive the Germans out of France, but also to stem their flowing tide of conquest in Russia. The British army in France and Flanders now numbered nearly a million men, and had taken over 17 miles of additional front, making a total of some 50 miles in all, the Belgians on the left holding the remaining 18 miles to the sea.

The great Franco-British offensive began on 25th Sept., in two parts, the first and most important being in the French centre in Champagne. Here Langle de Cary's Fourth Army, after a solid week's bombardment, was launched on a 16-mile front between Aubérive and Meuse, with the twofold object of driving the enemy back on the Aisne and cutting off the German Crown Prince's army in the Argonne. At first everything went well. The French centre swept over more than 2 miles of the main German defences, and might have achieved the Generalissimo's objects had its flanks succeeded in keeping pace with it. But on both sides impassable strongholds checked the French infantry after their initial success and stayed the advance.

The second half of Joffre's plan fell to the Franco-British armies in Artois. Feint attacks were delivered at various points—east of Ypres, north of the Béthune-La Bassée Canal, at Bois Grenier, and along the slopes of the Aubers Ridge—but the main British effort was made by Sir Douglas Haig's First Army at the battle of Loos, along a front extending from La Bassée Canal in the north to the village of Grenay on the south. Following an intense bombardment which lasted four days, and was succeeded by our first gas attack—its adoption having been forced upon us by its employment by the enemy—the advance at 8.30 a.m. was a brilliant success on the right, where the

15th (Scottish) Division, after capturing Loos with the 47th (London) Division, rushed on through the last German defences to the outskirts of Lens. Unhappily there were no reserves available to reap the fruits of this unlooked-for achievement. The French Tenth Army, on the right of the 47th Division, made no start until one o'clock in the afternoon, and was then held up at the point where they joined the British line, with the result that the Londoners had all their work cut out to safeguard their perilously exposed flank. They held tight, however, and maintained their hold on Loos.

On the extreme left of the British battlefield the advance was held up by unbroken defence works which took appalling toll of the 2nd Division. The 9th Division, to the right of the 2nd, was similarly sacrificed on its left wing against the Hohenzollern Redoubt, but swept past this undemolished stronghold with its right as far as Fosse 8. The 7th and 15th Divisions in the centre reached the Lens-La Bassée road, but could make no appreciable advance beyond. The 15th Division, on the right of the 1st, thus found both its flanks exposed after its impetuous dash towards Lens, and was forced back to the slopes of Hill 70 on the Lens-Hulluch road. Late in the day, after nightfall, two reinforcing divisions arrived on the scene. Misdirected, drenched to the skin, and thrown into their first fight after marching 8 miles, they were unable to hold up the counter-attacks with which the reinforced Germans were already recovering much of the hard-won ground. The Guards, however, won back most of the earlier gains on the 27th, including the slopes of Hill 70.

The total British losses in the battle amounted to 30,000 men and 2000 officers, including three divisional commanders, Major-General Sir Thomas Capper, Major-General G. H. Thesiger, and Major-General F. D. V. Wing. The new line was consolidated as the battle died down, the Germans striving without success to regain their lost positions in a series of costly counter-attacks, bringing their total losses in the battle, it was estimated, to considerably more than those of the British. A long struggle at close quarters ensued for the possession of the Hohenzollern Redoubt and its outworks, the 46th (North Midland Territorial) Division losing 4000

casualties in carrying the western side of the redoubt by storm on 13th Oct. On the British right the Tenth French Army, after being held up at Souchez, where it joined the Londoners on the opening day of the combined offensive, did better on 26th Sept. Not only Souchez then fell into their hands, but also Thélus and most of the Givenchy positions. Two days later they were on the slopes of the Vimy Ridge, but could only dig themselves in without winning the heights.

Thus the great combined offensive had fallen short of its objectives, and another winter of dreary siege warfare became inevitable. General de Castelnau took over the immediate command of the French troops, Joffre being appointed Commander-in-Chief of all the French forces. Before the end of the year, too, Sir John French resigned his command in France and Flanders—to be created Viscount French of Ypres and appointed to the Home Command—and was succeeded by General Sir Douglas Haig.

#### 1916

*Western Front.*—The chief hope of the Allies in 1916 centred in a combined offensive on all the main European fronts. Russia had resharpened her sword after the disasters of 1915; Italy was preparing to throw her full weight into the scale; and the Franco-British armies in the West had stored up vast reserves of guns and munitions for a fresh campaign on a scale greater than any which they had yet attempted. It was chiefly to put a spoke in the Allies' wheel that the Germans prepared the great assault on Verdun which all but succeeded in carrying that fortress in the critical days of February. There had been a number of preliminary operations along widely scattered sectors of the line, in Alsace, Champagne, Artois, Flanders, and elsewhere, all designed to mask Falkenhayn's main design. Verdun was guarded by a system of three lines of elaborately organized defences. The enemy hoped to blast a way through these by massing against them the mightiest assemblage of guns which the war had hitherto known.

The enormous weight of shell in the bombardment which heralded the opening attack on 21st Feb. did its work so thoroughly that the waves of infantry

which followed swept over the first line with little opposition, save at Brabant and one or two other places. The whole of the first line was in German hands by the 23rd, the defenders retiring to the line Samogneux-Herbebois. All that day, and the next, while the French were withdrawing their outposts from the Woevre in order still further to contract their line until General Pétain could receive his much-needed reinforcements, the Germans pressed their advantage until they were close to Fort Douaumont, "the eastern pillar of the Verdun defences", as the Crown Prince described it next day when he telegraphed that this dominating position was "solidly in German hands". The Brandenburgers, it is true, had that day carried the Douaumont defences between the redoubt and the village, but they were not long left in possession, Pétain's reserves flinging them back in a counter-attack which marked the turn of the tide in this first and most dangerous advance on Verdun. Henceforth the German assaults, pressed though they were with ever-increasing violence, were robbed of the element of surprise. Douaumont and Fort Vaux were both lost in this long-sustained struggle, but the Thiaumont redoubt marked the farthest point towards their goal which the Germans were destined to reach before the British on the Somme brought relief to the defenders. Before the end of the year the French, now under the command of General Nivelle, had recovered nearly all the ground thus won by the enemy at reckless cost.

Just as the operations on the French front revolved round the duel for Verdun throughout 1916, so the British campaign in the West centred in the first battle of the Somme, which began on 1st July. The earlier operations of the year—round Ypres and Loos, as well as at Ploegsteert and Givenchy, and among the mine craters at St. Eloi—were largely due to local attacks designed by the enemy to keep the British occupied with their own defences while they hammered at Verdun. At St. Eloi the brunt of the fighting was borne by the Canadians, whose lines were also rushed two and a half months later (2nd June), when Major-General Mercer was killed and General Williams captured. The Canadians completely re-established their broken line, however, before the end of that month.

The pressing needs of the French at Verdun caused the battle of the Somme to be somewhat premature. It was launched by Sir Douglas Haig on 1st July with Rawlinson's Fourth Army, in conjunction with the French Sixth Army under Fayolle, the combined offensive covering a front of some 25 miles from Gommecourt, north of the Somme, to Dompierre, south of that river. The preparatory bombardment lasted a full week. The whole region thus deluged with shells had, however, been powerfully fortified by the Germans for months previously. Not even the fiercest storm of explosives could obliterate all their defences, especially on the slopes of Bapaume, where deep underground fortifications remained immune from artillery fire. When the bombardment ceased, these strongholds were largely responsible for holding up the British thrust on the extreme left, between Gommecourt and Serre—designed as a subsidiary operation to the main advance—by one of the corps of Allenby's Third Army. Though pushed with the utmost bravery and determination, it could make no headway against the unbroken defences. Here, as well as across the Ancre, the Germans had massed their heaviest weight of artillery and organized their nests of machine-guns in impregnable positions. Beaumont-Hamel resisted all efforts to capture it; Thiepval was won and lost.

But while the first British attack thus failed on the left, it made substantial progress on the right, towards the Somme. Montauban and Mametz were both captured, and Fricourt was surrounded—to fall on the following day. On the British right, where the attack was least expected, the French had fared considerably better on both sides of the Somme, capturing Dompierre, Becquincourt, Bossu, and Fay on the south, and reaching the outskirts of Hardecourt, Frise, and Curlu, all of which were carried on the 2nd. The advantages thus won were relentlessly pursued from day to day, and as stubbornly contested. By 5th July, when the enemy had been driven back a mile on a front of 6 miles, he had lost 14,000 in prisoners alone. There had been no breach in the main German line, but the main objectives in this offensive were not so much territorial as indirect. The immediate object, the relief of Verdun, was being already attained, the Germans

being forced to relax their efforts on that battlefield in order to reinforce their troops on the Somme. The second object, the exhaustion of the German reserves, was also in process of being achieved.

The second German line was reached on 14th July, when the British troops captured Longueval, Trônes Wood, Delville Wood, and a further 2000 prisoners, though most of the gains were only retained after weeks of ferocious combat. South Africans, Australians, New Zealanders, and Newfoundlanders—most of them veterans of the Dardanelles campaign—all had a share in these battle honours. Pozières fell to the Australians on 23rd July, and the bitterly contested advance was pursued up the fatal slopes of the Bapaume Ridge. By the end of August the total British captures on the Somme amounted to 266 officers and 15,203 men, besides 86 guns.

It was obvious that there was little prospect of effecting a real break in the enemy's lines with the means then at the Allies' disposal. When, however, the third phase of the battle was opened on 15th Sept., hopes again ran high on account of the tanks—a British invention, used for the first time in this great advance. Spreading terror and destruction as they advanced, the tanks crowned the day with a series of resounding successes. Martinpuich fell to a Scottish division of the New Army; Flers to the New Zealanders; Courcellette to the Canadians, who formed the right of Gough's Fifth Army, now holding the British line on Rawlinson's left. The French had meantime improved their positions on each side of the Somme, and both allies pushed their advantages by slow but sure degrees until, by the end of September, the third German system had been penetrated. Then the weather broke and grew steadily worse until, as transport across the tortured battle-ground became wellnigh impossible, the promise of a decisive victory gradually faded away.

Thiepval Ridge was captured on 30th Sept., but throughout the next six weeks no general offensive was attempted until 13th Nov., when Gough's Fifth Army brought the Somme campaign to a close by the battle of the Ancre. Gough's army had cleared the way for this operation by a series of local successes since the end of September, the conditions being



more favourable on the higher ground towards Bapaume. In the final phase Beaumont-Hamel was stormed and carried by Highland Territorials, while the Naval Division on their right paved the way for the capture of Beaucourt on the following day. These and other gains were held in the face of German counter-attacks, but winter conditions prevented any further advance. From first to last the Somme campaign had yielded to the British 38,000 prisoners, 125 guns, and 514 machine-guns. It was estimated that the enemy's total casualties approximated to 600,000. Our own losses amounted to nearly 500,000.

Before the end of the year Sir Douglas Haig was created a Field-Marshal; Joffre was succeeded as French Generalissimo by Nivelle; and a British Coalition Cabinet was formed, with Mr. Lloyd George as Prime Minister, Mr. Asquith having resigned on 5th Dec.

*Eastern Front.*—The Germans had been forced to transfer some of their divisions at Verdun to the Eastern front, as well as to the Somme. Reorganized and better-equipped with guns and ammunition after the shattering blows received during 1915, the Russians made an astonishing recovery in 1916. There were heavy battles in the northern theatre in the region of Lake Narotch in March and April, but progress against the Germans along the Vilna Road was only attained at heavy cost. It was in the south, where Brussiloff was in command against the Austro-Hungarian front, that the most damaging thrusts were made. Here began on 4th June an advance by the armies of Kaledin, Sakharoff, Scherbacheff, and Lechitsky which extended from the Pripet marshes to the Bukovina, and swept on unchecked until, by the end of twelve days, it had created an immense salient 50 miles deep in parts and captured 126,000 men and over 100 guns. The situation became so serious that Ludendorff was sent to take matters in hand. Ludendorff and Linsingen's reserves arrived just in time to prevent the Russian success at the most northerly point of the salient from extending to the key position of Kovel. Brussiloff brought up fresh armies under Generals Lesh and Rogoza, but though they fought well, and added 17,000 prisoners to the Russian bag, Kovel was denied them. Ludendorff also reorganized the Austrians for the

counter-offensive in the south which, though it did not prevent the Russians from again advancing to the Carpathian passes, and adding to their total captures of this campaign until they included no fewer than 270,000 prisoners and 450 guns, succeeded in stemming the tide and keeping it in check—largely with the aid of Bolshevik propaganda with which the Russian lines were now bombarded—until it gradually wore itself out.

*The Balkans.*—Brussiloff's offensive, though it was thus prevented from achieving complete success, had the effect of deciding Romania to cast neutrality aside and fight on the side of the Allies, whose prospects now seemed to warrant the hope that intervention on her part would be rewarded in due course by the territorial additions which she needed to satisfy her national aspirations. Romania declared war against Austria-Hungary on 27th Aug. On the 29th Hindenburg was appointed Chief of the German General Staff (with Ludendorff as his right hand) in succession to Falkenhayn, who was relegated to the task of dealing with Romania once and for all. Romania played into Falkenhayn's hands by advancing in the first place through the Carpathian passes into Transylvania, to free that region from the Austrian yoke. The most pressing danger, however, threatened on her southern front, where Mackensen was preparing to invade Romania with a mixed army of Germans, Bulgarians, and Turks. Mackensen's march began on 2nd Sept. Three days later he had captured Turtucaia, on the Danube, with 20,000 prisoners. Pressing forward through the Dobruja, he followed the Danube towards Cernavoda, where stood the only bridge which spanned that river in the Balkans. Three Russian divisions came to Romania's assistance in the Dobruja by way of Constanta, and with the help of Romanian troops drove Mackensen back some 15 miles after he had reached the line Rasova-Kobadrina-Tuzla. Other Russian forces had also entered Romania on the east, but found opposing them the new German army under Falkenhayn—a stronger force than that of Mackensen's in the Dobruja, and prepared to fall on the Romanians with unlimited resources in guns and ammunition. Falkenhayn's advance north of the Carpathians developed on 30th Sept. near



the Roter Turm Pass, thus threatening the Romanian columns which had pushed forward into Transylvania. By 12 Oct. the Romanians had retreated by the way they had come, and were fighting valiantly for the passes. Had the Russians been able to lend their promised support, a very different story would probably have to be told of the Romanian campaign. But the Russians were already suffering from the creeping paralysis which was to lead to their collapse in the following year, and the Romanians were left practically single-handed in this northern theatre of war. Several additional Russian divisions were sent under Sakharoff to help the Romanians in the Dobruja in November, but were too late to avert the catastrophe which became inevitable when the two giant arms of the German pincers gradually closed on Bucharest. Mackensen had captured the Cernavoda Bridge on 20th Oct., and also crossed the Danube lower down in order to effect a junction with Falkenhayn's army, now advancing on Bucharest across the Aluta River. The two armies were in touch on 28th Nov., and the end followed swiftly. Bucharest fell on 6th Dec. On the 8th the Germans estimated their Romanian captures as 70,000 men and 184 guns. The remnants of the Romanian armies retreated with the Russians to the Sereth defences, and desultory fighting continued into the new year until the Germans forced Romania to sign the Treaty of Bucharest. The treaty was revoked by the Allies at the end of the war.

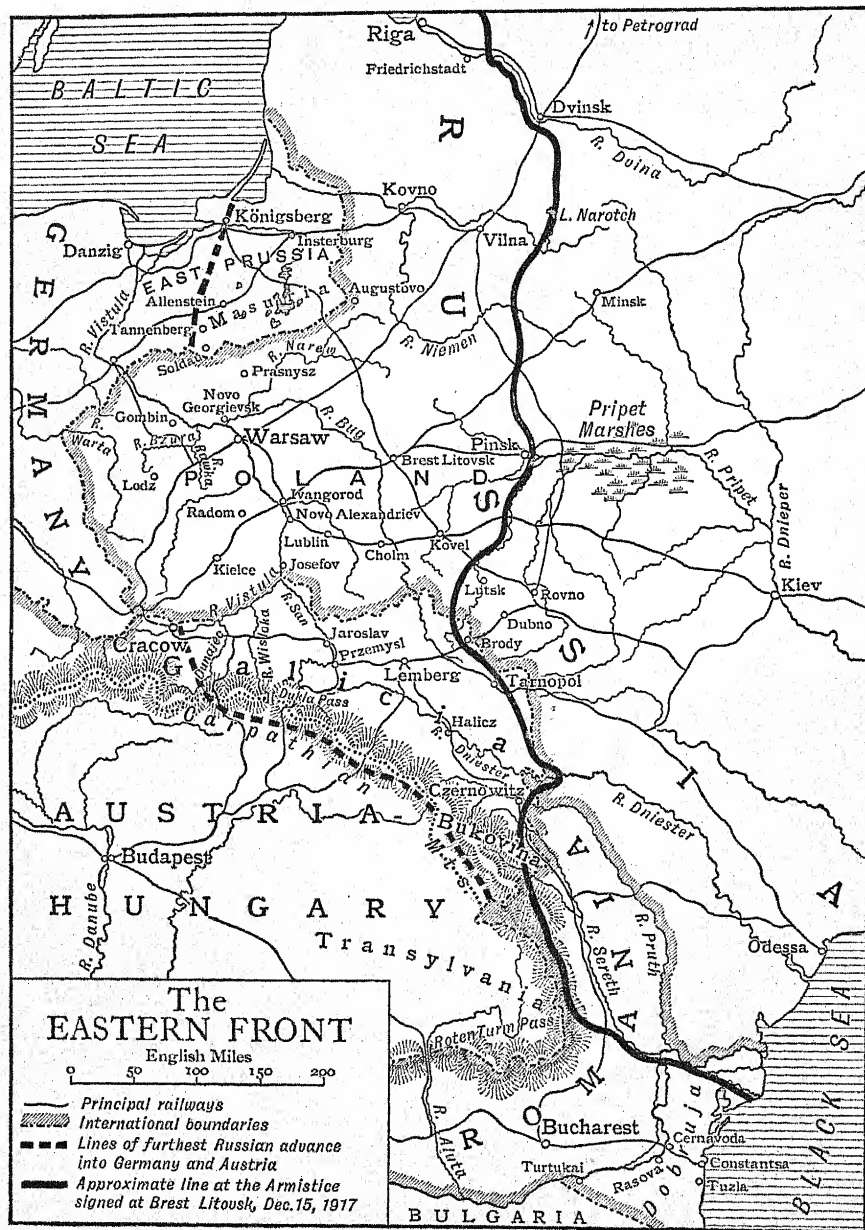
While Romania's fate was thus being settled, the Allies at Salonika were powerless to help save by keeping the Bulgarians pinned to their own front instead of throwing their whole weight into the new Germanic campaign. General Sarrail, reinforced by the newly equipped Serbian Army, resumed the offensive in September. French and Serbian divisions undertook the main advance in the direction of Monastir, a British column under General Milne meanwhile throwing the Bulgarians back from the Struma and ultimately beyond the railway between Seres and Demir-Hissar. Furious fighting for two months resulted in the recapture of Monastir, the Bulgar-German forces in this field falling back on 19th Nov., and the Serbians regaining possession of the town on the same day.

*Italian Front.*—An Italian contingent shared in the mixed force which General Sarrail had at his disposal in Salonika. Within their own frontiers the fortunes of war had called for all the strength the Italians could put into the field. Anticipating a fresh advance on Gorizia, the Austrians held up Cadorna's plans in that direction by a drive on the Mackensen scale from the Trentino, beginning on 2nd May. Unprepared for an avalanche of 350,000 men, the Italian troops were withdrawn from their untenable positions among the mountains until their line was drawn south of Asiago. The invasion was checked by the arrival of Italian reinforcements when the Venetian plains were almost within the Austrians' grasp, and all the enemy's efforts to complete this success proved unavailing. Cadorna also had his revenge in August, when he launched his own offensive on the Isonzo front, Gorizia being carried by the Third Army under the Duke of Aosta after three days of terrific fighting. The Italians pursued their advantage across the north end of the Carso—the plateau which led to Trieste—capturing before the end of the year between 30,000 and 40,000 prisoners.

1917

*Eastern Front.*—By the beginning of 1917 fighting on the grand scale on the Eastern front had given place to the deadlock which preceded the Russian Revolution. Though the situation was well known on the Continent, the first inkling came to the British public when the Tsar suspended the Duma on 12th March, following food riots in Petrograd. The reply to this was the general revolution, long planned by those 'Dark Forces' who were using the mismanagement, corruption, and hardships of the war, as well as the influence of Rasputin, the parasite of the Russian Court, to further their Bolshevik ends. On 15th March the Tsar, under compulsion, abdicated. For a time the Provisional Government declared its loyalty to the Allies, and its determination, now that it was better supplied than ever with the necessary munitions, to continue the war with renewed vigour.

Kerensky, who was appointed head of the Coalition Government in May, stirred the army into action once more, Brusi-



Ioff, who had succeeded Alexieff as Commander-in-Chief, undertaking a new offensive on the Austro-Hungarian front south of the Pripet. The fresh campaign began on 1st July, and was at first conspicuously successful, though the Russian commanders scarcely knew how far to trust their men, so insidiously had the taint of Bolshevism affected their troops. Korniloff, in particular, did well in this final offensive, breaking through on a 30-mile front in two days' fighting. But even Korniloff's troops, after pouring into the plains of the Dniester, mutinied, and brought the advance to a standstill. Elsewhere the rot became so complete that whole regiments left their trenches in face of the enemy. One German-Austrian attack found a complete division ready to surrender. Before the end of July the remnants of the Russian armies in the south were in disorderly retreat; the loss of the Bukovina followed that of Galicia; while farther north entire Russian army corps were deserting on the Dvinsk front. Thereafter Russia, for all practical purposes, was out of the war. By 20th Nov. hostilities ceased, and twelve days later negotiations for a separate peace began at Brest Litovsk between the Germans and the Bolsheviks. The Bolsheviks were now ruling in place of the Romanoffs, who were cruelly done to death on 16th July, 1918, when the Tsar and his entire family were assassinated.

*The Balkans.*—In the Balkans little change had meantime taken place in the military situation since the end of 1916. The only operations of importance were confined to attacks by General Milne on the British front in the Struma Valley, and a Franco-Serbian attack north of Monastir. The political situation was vitally changed, however, by the abdication of King Constantine on 12th June, 1917, in favour of his second son, Alexander, and the formation of a new Government under M. Venizelos. This at length brought Greece firmly on the side of the Allies, diplomatic relations being severed with Germany on 12th June.

*Italian Front.*—For the greater part of 1917 the initiative in the Italian campaign remained with General Cadorna, who used it in a series of smashing blows in the Trentino and across the Carso. These offensives, while they led to no decisive results, sufficiently exhausted the

Austrian troops to cause genuine alarm at the German Head-quarters. Freed from anxiety on the Russian front, the Germans now sent an army of eight picked divisions under Von Below and took control of a fresh campaign in conjunction with the Austrian troops. Finding a weak spot in the Italian line near Caporetto—where Bolshevik propaganda had played no inconsiderable part in demoralizing the Italian troops—the Germans burst through on 4th Oct., and, with their Austrian allies, opened a gap 20 miles wide over the Julian and Carnic Passes. The defenders' line was turned, and the greater part of their army forced to retreat until, becoming entangled with its own reserves, it broke in disorder. Following on the collapse of Russia, the situation became a matter of genuine alarm in London and Paris, and British and French divisions were at once rushed from France through the Alps. Before they arrived, however, the Italians had rallied sufficiently to check the invaders' headlong pursuit on the Piave, though not before they could claim 250,000 prisoners and 1300 guns of every calibre, besides immense quantities of munitions.

*Western Front.*—Before the 1917 campaign began Joffre had made it clear to Haig that France was coming to the end of her resources in man-power, and that the main burden of the war on the Western front must be gradually assumed by the British army. It was agreed to make an early start on the Somme with a combined offensive in the first fortnight of February, with the object of reaping the fruits of the 1916 campaign. Joffre's policy was cancelled, however, by changes in the French High Command which, as stated on p. 51, led to his retirement before the end of 1916, and his succession by General Nivelle, who had no intention of allowing the initiative to pass from the French in the West. Nivelle's ambitious plan was to strike at the German centre on a front of 50 miles, as a preliminary to which he called on Haig to extend his line towards the Somme before delivering his attack in that field, thus releasing two French armies for the great blow at the centre.

These changes delayed the combined offensive and gave the Germans time not only to recover from the bludgeon blows they had received on the Somme, but

also to complete their plans for withdrawing to the shorter and more powerful fortress line (the Hindenburg and Drocourt-Quéant switch line) upon which they had been hard at work all the winter. This withdrawal, which the Germans effected with comparatively little loss to themselves and complete ruin to everything as they retreated, upset both British and French plans. The area of the German retreat extended over a front of 100 miles, the Allies following in pursuit as fast as the wasted area and the resistance of the enemy would permit. By 17th March, when a general Allied advance was ordered, there were only German rear-guards and patrols on either side of the Somme. The British pushed their way steadily towards the Cambrai-St. Quentin line, while the French on their right advanced towards the new German positions from St. Quentin to the Chemin-des-Dames, thus paving the way for Nivelle's grand attack on Laon, where he hoped to repeat on an extended scale his previous triumphs at Verdun.

The battle of Arras, launched by Sir Douglas Haig on 9th April, was a preliminary both to Nivelle's blow and his own major offensive farther north, where he aimed at freeing the Channel ports by a burst from the Ypres salient. Two British armies, the First (General Horne) and Third (General Allenby), took part in the battle of Arras. Horne's army, with the Canadian Corps under Sir Julian Byng as shock troops, captured nearly the whole of the Vimy Ridge in the opening advance in brilliant style, and completed its conquest on the following day. The attack was extended on a 12-mile front from Givenchy-en-Gohelle, north of Arras and the Vimy Ridge, to a point about the same distance south-east of Arras, five villages and 6000 prisoners falling into British hands. Further advances were made on subsequent days, but the stubborn defence of the enemy at various important points prevented the Third Army from joining hands with the Fifth beyond the third German line until it was too late. In the first three days of the battle, however, some 12,000 prisoners and 150 guns were taken.

Britain's operations in this field were only continued in order to help Nivelle in his approaching attempt to pierce the German centre between Soissons and

Rheims. This second battle of the Aisne, planned over a length of 50 miles, and launched on 16th April, proved so costly, especially at the Chemin-des-Dames, where the chief sacrifices were made, that the morale of the French army was seriously shaken, and Nivelle's plan was abandoned. On 16th May he was succeeded as Commander-in-Chief by General Pétain, with General Foch as his Chief of Staff. The French advance, though it had resulted by 28th April in the capture of 28,000 prisoners and 175 guns, as well as some of the strongest positions on the Aisne, had fallen far short of its too-confident promise, and imposed too severe a test upon the battle-worn army of our Allies. General Pétain found it necessary to call upon the British Commander-in-Chief to strain his utmost to keep the enemy employed until he had time to restore his army's confidence. For the rest of the year his task was devoted to this end by a series of limited offensives, skilfully planned, which succeeded in enlarging the French gains at various points and repelling German attempts to regain some of the positions won.

On the day following Pétain's appointment the British army captured Bullecourt, which had been the scene of some of the bloodiest fighting in the struggle for the Hindenburg switch line; and did all that was asked of it in these sanguinary operations to help the French in their hour of need. The sacrifices were heavy, and valuable time was lost before the battle of Arras died down and Haig's major offensive in the north could be started. The preparatory step to this was taken, however, on 7th June, when the battle of Messines was fought and won by the Second Army under General Plumer—one of the most complete technical successes of the war. The preliminary mining of the Messines-Wytschaete Ridge, and every other preparatory detail, had been so skilfully planned that Plumer's attack, launched shortly after 3 a.m., went like clockwork. Nine miles of front were carried before the enemy had time to organize counter-attacks, and when these were duly made they only succeeded in adding to the total of 6400 German prisoners captured on the opening day.

The way now seemed clear for the main British operation, designed to wipe out the Ypres salient and free that strip of



the Flanders coast—near Nieuport, Zeebrugge, and Ostend—which served the enemy too well in his submarine campaign. Haig had hoped that the French would help by taking over part of the line which he was still holding in Artois, but the French High Command preferred instead to share in the coming grand attack in the north. The French First Army under General Anthoine was therefore brought up to take over the line previously held on the British left—between Boesinghe and Noordchoote. The Germans were naturally on the qui vive, and when Rawlinson's Fourth Army took over the line to the coast during the second half of June they suspected a combined attack along the coast by land and sea. Accordingly, with the object of forestalling any plans of the kind, they massed sufficient guns and troops to storm the bridge-head at Lombartzyde on 10th July, during a heavy gale, which prevented the British ships from joining in.

Most of the positions then lost were recovered, and on 31st July Sir Douglas Haig was at length able to put into effect his long projected major plan. This Third Battle of Ypres began with a combined British and French attack on a 15-mile front from Boesinghe to Zillebeke, the bulk of the fighting falling to the Fifth British Army under General Gough. Some 5000 prisoners and 12 villages were taken in this opening assault, but the task grew sterner with every succeeding step up the heavily fortified ridges, where the Germans had had time to bar the way with concrete 'pill-boxes', and other machine-gun strongholds, capable of holding up attacks before there could be any real break through. The British offensive lasted, with various intervals, until the middle of November, when the torrential rains of a wet autumn rendered further progress impossible along the muddy slopes of the tortured battlefield.

Third Ypres, with its total casualties of 230,000 in killed, wounded, and missing, was the costliest battle hitherto recorded in the annals of the British army. The Ypres salient, however, had at long last been wiped out, and a heavy toll taken of German prisoners and positions, the last phase closing amid stress of weather in mid-November after the capture of Passchendaele on the 6th by the Canadians. Above all—and the chief justification for

this prolonged agony—the British army had given Pétain time to restore confidence to the French army.

In accordance with the French Commander-in-Chief's request to keep the enemy fully occupied, Haig launched his surprise attack on 20th Nov., in an unexpected quarter—Cambrai—with the Third Army under Byng. On this occasion there was no preliminary bombardment, tanks being employed for the first time in large numbers to lead the advance. So complete was the enemy's surprise that the 'Hindenburg Line' was broken. Numerous villages and 8000 prisoners were captured, and if the cavalry had been able to complete the enemy's discomfiture at this point a lethal injury might have been inflicted on his resistance. But the cavalry were unable to follow up in time, and the withdrawal of five British divisions for Italy on the eve of the attack prevented Haig from fully exploiting his success. The ground won had not been firmly consolidated, after days and nights of desperately hard fighting, before the Germans retaliated with a counter-attack on 30th Nov. almost as crushing in its sudden impetus as the original British assault. There was heroic fighting in the newly created salient at Bourlon Wood and Moeuvres, but before the end of the year a great part of the hard-won positions had to be evacuated.

#### 1918

*Western Front.*—At the end of Jan., 1918, the Supreme War Council met at its head-quarters at Versailles to decide on its plans for the year. This organization, brought into being by the Italian disaster at Caporetto in the preceding autumn, was the first definite step towards co-ordinating the Allied effort. It consisted of the chief Allied ministers, with permanent military advisers. The outlook at the beginning of 1918 was such as to cause the gravest anxiety. With Russia out of the war, Germany, no longer haunted by the fear of having to fight for her life on two fronts, was able to reinforce her armies in the West until by Jan., 1918, the number of her divisions considerably outnumbered those of the Allies—175 against 163. In the preceding summer she had only been able to oppose 108 divisions to the Allies 178.



America, it was true, had thrown in her lot with the Allies after the Germans inaugurated their unrestricted submarine campaign on 1st February, 1917. She declared war on 6th April, 1917, but it would be months yet before she could put in a sufficient number of trained troops to turn the scale in the Allies' favour. Meanwhile, Germany, as everyone realized, would make her supreme effort to reach a decision before they arrived.

The first blow fell on 21st March, between two and three weeks after the signing of the Treaty of Brest Litovsk, by which the betrayal of the Allies by the Bolshevik rulers of Russia was formally completed. Germany was now free to concentrate her forces in the West, and had specially trained nearly half a million men for the opening blow of the new offensive, delivered in a thick morning mist in two parts, the southern attack against Gough's Fifth Army from the Flesquières salient opposite Cambrai to St. Quentin, and the northern onslaught against Byng's Third Army from the Sensée River to the Cambrai Road. The brunt of the battle was borne by Gough's Army, which, earlier in the year, and much against Haig's better judgment, had been ordered to take over a new stretch of line to the right, beyond the Oise, in order to relieve the French. This had left the Fifth Army with a front of no less than 42 miles to guard.

It was impossible to hold this against the terrific onslaught of the enemy, no fewer than 64 German divisions being pitted against 19 British infantry divisions in line and 10 in reserve, with cavalry. The total number of Germans employed from first to last in this opening phase of Ludendorff's offensive exceeded in numbers the total fighting strength of all the British armies in France. So secretly had the preparations been made with sunken roads and every device of camouflage, that the colossal blow fell with even greater force than had been anticipated. Two serious breaches were made at once along the Fifth Army's attenuated front, and before there was time either for the British reserves or French reinforcements to repair them, General von Hutier's shock troops had burst clean through. Thenceforward the tide swept on for days, only temporarily checked here and there as the hard-pressed British troops strove

in vain to stay the overpowering weight of numbers. By 27th March the Allies were back across the battlefields of the Somme, beyond the line from which they had started in the combined offensive of 1916.

Meantime the 'hammer-blow' against Byng's Third Army in the north had not gone so well for the enemy. Here the British positions were stronger, and though some gaps were made they were not beyond repair. In the southern half of the battlefield the Germans swept on until they were within a dozen miles of Amiens. Their effort, however, was becoming spent, and Amiens was saved by a last-line defence hurriedly formed from stragglers, army school personnel, and others—organized by General Grant and known as 'Carey's Force'—together with the 1st Cavalry Division, which was rushed across the Somme at the same time. The French Third Army subsequently prevented the enemy from extending his gains in the south.

On the 28th he made a determined effort to shake Byng's Third Army from the new battle positions to which it had fallen back in good order to conform to the retreating line of the British Fifth Army. The command of the Fifth Army was relinquished by General Gough on this day, the task of extricating the shattered divisions devolving upon General Rawlinson, of the Fourth Army. There was no fog this time to help the Germans in their renewed onslaught on the Third Army, and British gun-fire from hidden positions broke down wave after wave of German shock divisions at point-blank range. Every succeeding attempt that day failed with appalling loss. Elsewhere, too, the situation improved as French and British reinforcements arrived on the scene, recovering some of the ground on 30th March. When the enemy resumed his advance on 4th–5th April it was only on a comparatively limited scale, and led to no gains of vital importance.

Finding his road barred to Amiens, Ludendorff launched his second blow, a final bid for the Channel ports. Carefully selecting the sector held by Portuguese troops<sup>1</sup> as the point in which to thrust the spear-head of the attack, the Germans, again favoured by a thick fog, burst

<sup>1</sup> Portugal had joined the Allies in the spring of 1916, when Germany declared war on her.

through the line with an army corps in the early hours of 9th April in the direction of Festubert-Armentières. The attack blazed up to north and south along the front held by the British First Army under General Horne. The 40th Division in the north was forced back on its right flank  $3\frac{1}{2}$  miles in its rear; but the 55th Division in the south, strengthened later in the day by the 21st Division, held its ground so stubbornly that the German onrush was checked.

It spread next day to Plumer's Second Army in the north, two German armies, with endless reinforcements, now uniting to push their advantage home. Carrying the Lys in the south and the historic Messines Ridge in the north, as well as many other landmarks immortalized in previous battles, they forced the evacuation of Armentières. In two days they had so gravely extended their gains that Sir Douglas Haig issued his famous Order of the Day to his troops declaring that every position must be held to the last man:

"With our backs to the wall, and believing in the justice of our cause, each one of us must fight on to the end. The safety of our homes and the freedom of mankind depend alike upon the conduct of each one of us at this critical moment."

The appeal was not in vain. The troops fought to the last ounce of endurance, and though by midnight on the 15th the never-ending blows of the enemy had forced the British line back to the defences between Meteren and Dranoutre—and the simultaneous withdrawal from the Passchendaele Ridge—signs were not wanting that the Germans had paid too dearly for their gains. Their advance slowed down, and with French reinforcements arriving the Allies began to breathe more freely in the Ypres area. Two remaining efforts were made by the Germans to snatch a decisive victory before the end of the month, the first on 25th April, against the French, who had taken over the sector from Meteren to Wytshaete, when Kemmel was lost; and the second, four days later, against the Franco-British front, when the Germans, after reaching as far as Loere, behind Kemmel, were flung back with such losses that Ludendorff had to abandon this last attempt to win through to Ypres and the Channel ports.

The crisis through which the Allies had passed, and still faced, had at long last brought about that unity of command which was to prove so fateful in the closing phases of the war. It was on Haig's initiative, after the retreat of the Fifth Army on the Somme, that the conference took place at Doullens on 28th March at which Foch was appointed to "co-ordinate the action of the Allied armies on the Western front". On 14th April, in the critical days when the British had their backs to the wall round Ypres, Foch was formally appointed Commander-in-Chief of the Allied armies.

All Ludendorff's hopes were now centred in the third and final phase of his offensive—a mighty drive on the Aisne front in the direction of Paris. For this purpose he brought up masses of specially trained shock troops at the last possible moment, accompanied by a fleet of German tanks and a vast assemblage of guns and aeroplanes. The French, who were supported along the Aisne front by the 9th British Corps under General Sir A. Hamilton-Gordon, learnt of the impending blow only when it was too late to avert disaster. Outnumbering the Allies by six to one when this fresh advance began in the early morning mist of 27th May, the German storm troops carried the whole of the Chemin-des-Dames, and by nightfall were fighting on the Aisne. Before the end of the 29th they had swept on across the Vesle, captured Soissons, and were seriously threatening Rheims. By this time the shattered remnants of the 9th British Corps formed part of Berthelot's Fifth French Army, which, with Gouraud guarding the Champagne front on its right, succeeded in saving the cathedral city.

The pick of the German troops pushed on in the centre as far as the Marne at Château-Thierry. Here, on the 28th, they came in touch with the American troops, who, linked to a French Colonial division, helped to prevent the passage of the river at this point. Eager to get more elbow-room, Ludendorff extended the battle on his right as far as Montdidier in the hope of flattening out the new Marne salient, but the progress made was out of all proportion to the losses sustained. Another attempt on Rheims was made on 18th June, but though the Germans were ordered on this occasion

to carry the city at all costs they failed completely. The next few weeks were spent in minor operations at various points and vast preliminaries on both sides; Ludendorff was planning his culminating stroke of the war, designed to burst through the Allies' line on a 50-mile front, and Foch was preparing the great counter-stroke which was to be delivered as soon as Ludendorff's commitments should warrant it.

The last German offensive began on its 50-mile front on each side of Rheims on 15th July. On the left, against Gouraud's army, where immediate success was vital to victory, it was shattered at the very beginning. Gouraud, who had been warned of the attack in time, had withdrawn his troops—save for volunteer garrisons in concrete forts—to their main battle positions, and forestalled the enemy by bombarding his lines before the German guns began. The storm troops found the front lines deserted. Before they could reach the main French positions they were exposed to a concentrated fire which blew them to pieces. No fewer than 50,000 German troops fell on this stricken field.

On the enemy's right, where Italian as well as British and American troops were fighting side by side with the French, the Germans pressed back the line southwest of Rheims some 3 or 4 miles, but in so doing were merely extending the death-trap which Foch was preparing for them. When, two days later, seven German divisions crossed the Marne between Dormans and Fossey, the French Generalissimo decided that the hour had at length arrived for his counter-stroke in this second battle of the Marne. He had already assembled his reserves, under cover of the forest of Villers-Cotterets, behind the front which he had selected for his attack, on the western side of the German salient between Soissons and Château-Thierry.

The first counter-stroke fell on the morning of 18th July, when two French armies, Mangin's on the left, which included the 34th and 15th British Divisions, as well as a number of American troops, and Degoutte's on the right, burst through the vulnerable German flank right from the Aisne almost to the Marne. Surprised as they were by this smashing onslaught, the Germans were not slow to grasp its significance. Von Boehn, the German

commander, at once ordered his troops beyond the Marne to recross that river. They lost heavily in doing so under a relentless pursuit by the French army under de Mitry. Château-Thierry was abandoned by 20th July, and Berthelot's mixed forces on the eastern side of the salient, whose task had hitherto been to hold the Germans hard without advancing, now began to attack vigorously.

Meantime Mangin and Degoutte pushed steadily on, and the German retreat everywhere in the salient became general. In three days the enemy lost 20,000 prisoners and 450 guns. By the 28th the Allied attack on the left had swept convergingly on to the line of the Ourcq. Three days later Soissons fell to Mangin, and Foch was free to develop the main plan which he had already discussed with the British Commander-in-Chief. Until he was assured, however, that the enemy had used up his reserves—and these were known still to be extremely strong—Foch felt his way by the safe policy of limited attacks.

In accordance with this plan Haig had agreed to strike towards the German centre, where it was least expected. This attack was launched on 8th Aug. with Rawlinson's Fourth British Army on the Somme, with the First French Army on its right under Debeney—both directed by Haig. The front extended for 16 miles from Morlancourt to Moreuil—the new defence line of Amiens. Falling like a thunderbolt on the enemy and supported by 400 new tanks of an improved pattern, it carried the whole German line at once. Some 17,000 prisoners and 500 guns were taken on that day alone. Rawlinson's army regained the old outer-line defences of the city, while Debeney's troops, reaching Frasnay and Plessier, linked up with Humbert's Third French Army on the road to Roye. On the following day Humbert extended the attacking line by capturing Montdidier and a number of villages.

By this time Ludendorff had decided that 'strategic retirement' was the only course open to him here, as in the salient on the Marne. Von Below, on the Amiens front, was ordered to withdraw to the shelter of the Hindenburg line behind it. This time the Germans were not allowed to choose their own time for retreat, as in the 1917 battle of the Somme. Byng's

Third British Army was thrown in on the left of Rawlinson's Fourth Army, and together they pursued the enemy remorselessly, though the Germans fought stubbornly enough in many places. The battle of Bapaume, as this phase of the offensive became known, lasted from 21st Aug. until the 29th, when that town again fell into British hands. The battle cleared the Germans once more from the old Somme battlefield—with a total loss of 34,000 prisoners and 270 guns—and opened a gap at Bullecourt (on 1st Sept.) in the formidable section of the Hindenburg defences known as the Drocourt-Quéant switch line. On the same day the Australian Corps added Péronne to their battle honours. Still extending his offensive on the left, Haig attacked with Horne's First British Army—including two Canadian divisions—on the Arras front on 2nd Sept., breaking through the northern defences of the Drocourt-Quéant line and taking 16,000 prisoners and 200 guns.

While the British were thus advancing in the centre beyond expectation, Foch maintained ceaseless pressure with the three French armies extending the British battle line on the right. By the beginning of September Debeney had crossed the Somme and was threatening St. Quentin; Humbert was pressing on towards La Fère; and Mangin held the railway from Coucy-le-Château to Soissons, whence Degoutte was steadily advancing along the Aisne. By the middle of the month the French troops were once more in sight of Laon; and, more significant still, a fresh blow had fallen on the enemy at another point—the old salient of St. Mihiel, which was carried by storm on 12th–18th Sept. by the American Army under General Pershing, now attacking for the first time as an independent command.

Two French divisions were attached to the Americans, and two Austro-Hungarian divisions were helping the Germans to hold the salient. The Germans were preparing to leave when the attack began, and their line collapsed under the sudden blow, the stoutest resistance being offered by the Austro-Hungarians. All told some 10,000 prisoners and 450 guns were captured before the Americans had completely wiped the salient off the map.

America's increasing strength and experience in the field enabled Foch to look

ahead without fear of exhausting his reserves. American troops had been pouring in at a rate which brought their total to more than two millions before the summer was over; and there were other millions available. While the Allies were thus assured of unlimited reinforcements, Ludendorff's strength was decreasing ominously. His reserves were still further reduced by Haig's next 'blow at the heart' of the German defence, delivered by the Third and Fourth Armies on 18th Sept. after a series of local attacks earlier in the month which had recovered among other positions Havrincourt, Trescault, and Maissemy. The combined assault of the two British armies extended from Gouzeaucourt through Havrincourt to Holnon Wood, where it was assisted by Debeney's First French Army. The battle of Epéhy, as it was named—from the scene of its hardest fighting on the left centre of the line—drove the Germans back to the shelter of the main Hindenburg defences, the British capturing another 12,000 prisoners and 100 guns.

This success served as the prelude to the second stage of Foch's victorious offensive, and was followed by a week's pause until his plans were ripe. The new move was designed to burst through the main Hindenburg lines with the First, Third, and Fourth British Armies, with the First French Army on their right, capturing Cambrai and St. Quentin, and pushing on towards Maubeuge, while thrusts were made by Gouraud's Army at Rheims and by the Americans in the Argonne, complementary operations being carried out at the same time by the Fifth British Army (now commanded by Birdwood) at Lille and Lens, and the French armies of Humbert and Mangin at St. Gobain.

The decisive phase began on 27th Sept., when Haig's armies struck what Foch described as the blow from which there was no recovery. Seizing the crossings of the Canal du Nord, the First and Third British Armies prepared the way for the Fourth British Army, and helped it two days later, with the assistance of the First French Army, in a furious battle along a front of 20 miles, to carry by storm the tremendous defences of the St. Quentin Canal. St. Quentin itself was recovered on 1st Oct., and three days later the Fourth British Army had broken beyond



repair that vital section of the Hindenburg defences which the Germans had called the Siegfried line. When Cambrai fell on the 9th the enemy had lost in this decisive attack 36,000 prisoners and 380 guns.

The German defences were now tottering in all directions. Franco-American divisions in the south were slowly but surely breaking them down in an advance from Verdun; Gouraud was wearing them down on the other side of the Argonne; and away in the north, as Foch had anticipated, they had already melted away. When Plumer's Second British Army, with the Belgian Army and French divisions, attacked in the coastal sector on 28th September they had little difficulty in carrying the weakened German front. By the end of the month the whole of the Passchendaele Ridge of dreadful memory had passed into the Allies' hands, and by the middle of October von Einem's German Army was far from the coast.

The story of the rest of the campaign is little more than a record of rapid reconquest. On 18th Oct. Laon—long the German Great Head-quarters—was occupied by Mangin's French Army. Four days later Ostend fell, Horne's First British Army occupied Douai, and Birdwood's Second British Army liberated Lille. Bruges was re-entered by King Albert on the 25th; Valenciennes was entered by the British on 2nd Nov.; Gouraud and the First American Army (now under General Leggett, General Pershing commanding the Second American Army, which Foch had in mind for a final stroke in the neighbourhood of Metz) joining hands north of the Bourgonne Forest, Gouraud reached Rethel on the 6th, and an American division entered Sedan on the same day. Realizing the hopelessness of the position, Ludendorff sent his request for an Armistice on 9th Nov.—the very day on which the British army found itself back in Mons, where its first blow had been struck in the war more than four years before. The Armistice terms were signed on 11th Nov. They included, besides evacuation of all conquered territory, the surrender of the bulk of the German navy, 5000 additional guns, 30,000 machine-guns, 3000 trench-mortars, and 2000 aeroplanes. A zone of territory on the Rhine was to be occupied by the Allies as guarantee for

the due execution of the agreement, and the Treaties of Brest Litovsk (signed by the Bolshevik Government with the Central Powers on 3rd March, 1918) and Bucharest (forced on Rumania in March, 1917) were declared null and void. On the day on which these humiliating terms were accepted William II abdicated. He sought refuge in Holland on the following day, when Friedrich Ebert, an ex-saddler, with a Government formed by both wings of the Socialist party, became 'First Imperial President of the German Republic'.

*The Balkans.*—The military situation in the Balkans remained practically unchanged until the autumn of 1918, and then altered as dramatically as that on the Western front. General Sarrail had been succeeded in supreme command of the Allied forces by General Franchet d'Esperey, who launched a new offensive on 15th Sept., with the French and Serbian troops on the left, or Monastir, front, and the British and Greek troops on the Doiran front. Driving a wedge between the First and Second Bulgarian Armies, the vengeful Serbians, with their supporting French divisions, drove the First Bulgarian Army back in headlong flight, while the British and Greek divisions, which had suffered heavily in storming the impregnable positions on the Doiran front, pinned the Second Bulgarian Army to this sector until the fate of the First Bulgarian Army had been decided. Then, hurriedly evacuating their positions, the Bulgarians on the Doiran front fled towards Sofia, the British and Greek forces under General Milne crossing the Bulgarian frontier hard on their heels within the next few days. Thoroughly war-weary, and realizing the hopelessness of Germany's position in the West, Bulgaria now called for peace. Under the terms of the Armistice, which she signed at Salonika on 30th Sept., she agreed to demobilize her armies, surrender their arms and ammunition, and hand over complete control of the Bulgarian railways and communications. On 4th Oct. King Ferdinand abdicated in favour of his son, Boris III.

*Italian Front.*—It was part of the plan for the grand offensive of the Central Powers that the Austro-Hungarian army, now under the command of General von Arz, should crush the Italian front while



Ludendorff was delivering his hammer-blows in the West. The main Austro-Hungarian attack began on 15th June along the Piave, when the Germans were rejoicing over their delusive prospects on the Marne. It made some progress along its 46-mile front, the Piave being crossed in two places, but west of Asiago it was held up by the two British divisions, with the French divisions on their right supporting the Italians in this sector. Nowhere had the attack made any decisive headway before heavy rains turned the Piave into a raging torrent and restored the initiative to the Italian Commander-in-Chief. Taking every advantage of the floods, which swept away a number of the enemy's bridges, General Diaz harried the Austro-Hungarians in their retreat across the river so relentlessly that their losses were estimated at 200,000 before the battle died down.

Italian arms were finally crowned with triumph four months later when Diaz delivered his own great counter-offensive. The main attack in this closing campaign took the form of an advance across the Piave on the night of 23rd-24th Oct. by the Tenth Italian Army—now including three British divisions, and placed under the command of Lord Cavan—in conjunction with the Eighth and Twelfth Italian Armies. Cavan's troops paved the way to victory by seizing at midnight the Island of Grave di Papadopoli, which the enemy had held in the Piave midstream, thus safeguarding the passage of the Allies across the flooded river. The rent made in the Austro-Hungarian line at this point spread until by the end of the month every position had been carried between the Brenta and the Piave, and three Italian armies were sweeping the enemy from the plains and mountain heights beyond, and claiming 50,000 prisoners. The Fourth Italian Army, with a French division, meantime advanced across the old battle-ground of Asiago and Monte Grappa, only temporarily checked by an Austrian counter-attack. The fact that by 3rd Nov. the enemy surrenders in this campaign amounted to some 300,000 men and 5000 guns is sufficient evidence of the perilous position in which the Austro-Hungarian army found itself. Anticipating Germany's request to Foch, Austria appealed to Diaz for an Armistice, and agreed to terms on 3rd Nov., which

included the surrender of the Austrian fleet, the demobilization of her army, and the occupation by the Allies of the Trentino, the Istrian coast and islands, and a portion of the Dalmatian coast and islands. Trieste had been occupied by an Italian landing force that very day.

### *The Naval War*

The opening months of the war found the British Grand Fleet, under Sir John Jellicoe, in secure possession of the seas, and maintaining its ceaseless vigil from its three bases of Scapa Flow in the Orkneys, Cromarty Firth, and Rosyth. The Germans, meanwhile, were sheltering their main naval force, the High Seas Fleet, in Kiel and Wilhelmshaven, while their submarines, mine-layers, raiders, and a few commerce-destroyers, together with von Spee's distant squadron, did all the damage they could before being scattered or sunk.

In home waters, the first naval action which developed any serious fighting was the battle in the Bight of Heligoland on 28th Aug., 1914. With the object of tempting the Germans out, a flotilla of submarines under Commodore Keyes was sent in close to Heligoland, together with a force of destroyers, led by Commander Tyrwhitt in the new light cruiser *Arethusa*, and accompanied by another light cruiser, *Fearless*. The lure served its purpose. A German force of destroyers, with two cruisers, accepted the challenge, but was driven back, mainly by the gallantry of the *Arethusa*. Thinking that the British ships were unsupported, the Germans now sent out their heavier cruisers, the *Mainz*, *Köln*, and *Aurora*, only to find, when too late, that Beatty's battle-cruisers, led by the *Lion*, were at that moment arriving to settle the issue. This was not long left in doubt once the *Lion's* 13·5-inch guns opened fire. Two enemy cruisers, together with a number of their destroyers, were sunk without the loss of a single British unit.

A month later (22nd Sept.) the Germans had their revenge by sinking the three old sister cruisers, *Aboukir*, *Hogue*, and *Cressy*, by torpedoes from the submarine commanded by Otto Weddigen. A more serious naval loss was that of the super-Dreadnought *Audacious*, which struck a mine off the north of Ireland on 27th

Oct. For the rest the early months of the war in home waters was marked only by such isolated incidents as the destruction of four German destroyers by the British light cruiser *Undaunted*, supported by destroyers (17th Oct.), and two raids by fast German cruisers on the East Coast. The first of these, on Yarmouth (3rd Nov.), led to the sinking of the German cruiser *York* while crossing the mine-field at Wilhelmshaven. The second was on Scarborough, Whitby, and the Hartlepoons (16th Dec.), when over 100 civilians were killed and some 500 wounded.

In more distant seas the scattered units of the German navy were gradually accounted for. The light cruiser *Emden* vanished from the China station to reappear first in the Bay of Bengal in September, bombarding Madras and capturing some 20 British steamers; and a month later in Penang Roads, where she sent a Russian cruiser and French destroyer to the bottom. She was caught off Cocos (Keeling) Islands on 9th Nov. by the British cruiser *Sydney* and forced ashore, where, burning and half-sunk, she surrendered after losing 7 officers and 104 men. Nearer home the two powerful German ships the Dreadnought *Goeben* and the light cruiser *Breslau*, which were in the Adriatic at the beginning of the war, escaped to Constantinople, where, by a secret agreement between Turkey and Germany, they passed nominally under the Turkish flag, though it was not until 5th Nov. that the Allies declared war on Turkey.

The only German squadron remaining at sea was that of five vessels under von Spee, stationed in the Pacific. This force, when that ocean no longer became safe on account of the Japanese declaration of war on Germany on 23rd Aug., fell in with the weaker British squadron under Admiral Cradock off Coronel on the coast of Chile on 1st Nov. Outsteamed and outgunned, the British ships—the cruisers *Good Hope* (flagship), *Monmouth*, and *Glasgow*, and the armed liner *Otranto*—were completely at the mercy of the Germans. The *Otranto* was sent away before the battle opened; and Cradock, before he went down with his flagship—blown up by the guns of von Spee's flagship *Scharnhorst*—also ordered the *Glasgow* to escape in time to warn the pre-Dreadnought battleship *Canopus*,

which was convoying colliers some twelve hours away. The *Monmouth* suffered the fate of the *Good Hope*. There were no survivors from either ship, some 1500 officers and men thus perishing with Cradock in this disaster off Coronel.

Five weeks later they were avenged off the Falkland Islands by the British squadron under Sir Doveton Sturdee, specially dispatched for the purpose by Lord Fisher, who succeeded Prince Louis of Battenberg as First Lord of the Admiralty on 20th Oct. The British squadron included two new battle-cruisers, the *Invincible* and *Inflectible*, which, with four lighter cruisers, gave them an overwhelming superiority over the enemy. Sturdee took von Spee by surprise off the Falkland Islands on 18th Dec., and the German admiral, seeing that his ships were no match for the British battle-cruisers, at once sought safety in flight. He was gradually overhauled, however, and, like Cradock, died fighting. Besides his flagship the Germans lost in this battle the *Scharnhorst's* sister ship, the *Gneisenau*, and the smaller cruisers *Nürnberg* and *Leipzig*. The cruiser *Dresden* alone escaped—to be destroyed three months later at Juan Fernandez.

With the last of the scattered German cruisers accounted for, and the German High Seas Fleet lurking in harbour for Admiral Jellicoe to be goaded into some imprudent change of strategy, the following year (1915) passed with comparatively few naval engagements of outstanding importance, apart, of course, from the vital part played by the navy in the Dardanelles campaign, dealt with elsewhere. There was, however, ceaseless work for the British navy in keeping watch and ward in the North Sea, guarding British commerce from raiders and submarines, and escorting British troops to the various theatres of war, every month increasing the Allies' commitments in all parts of the globe.

Early in 1915—on 24th Jan.—Admiral Beatty, with his battle-cruiser squadron, accompanied by squadrons of light cruisers and destroyers, came in touch with a German reconnoitring force, consisting of 4 battle-cruisers, 6 light cruisers, and a force of destroyers, off the Dogger Bank. The Germans at once turned for home at full speed. In the hot pursuit which followed the German battle-cruiser *Blücher* was

sunk and two other enemy battle-cruisers set on fire, though these succeeded in escaping. Beatty's flagship, the *Lion*, was hit by a shell which reduced her speed until she had to be towed home, Beatty himself meantime continuing the chase in a destroyer. Unfortunately, owing to a misinterpretation of his signals, the action was broken off before he could resume his place in the pursuit. The enemy, however, had been taught his lesson. He attempted no more naval raids on the East Coast that year.

Relying more and more on the submarine to challenge our supremacy at sea, the Germans proclaimed on 4th Feb., 1915, a submarine blockade of the whole of the British Isles. The object was to paralyse British trade by scaring away shipping of every description, all the surrounding waters being declared a military area in which not only Allied merchant ships were to be destroyed, but neutral ships would run serious risks of meeting the same fate. Carrying out this threat with characteristic ruthlessness, the Germans crowned their record on 7th May, 1915, by sinking the Cunard liner *Lusitania* off the south-west coast of Ireland, with the loss of 1000 lives, men, women, and children. Over 100 Americans were included in this death-roll. It was the first of the series of German crimes which two years later was to bring America into the war. It failed, like every other incident in this submarine campaign, to scare British shipping away, though it took heavy toll of peaceful merchantmen throughout the year.

In 1916, while the Germans were straining every nerve on land to forestall and check the combined offensive of the Entente, they were driven to even more desperate developments at sea. On 1st March of that year they inaugurated a new phase of the submarine war by sinking merchant ships at sight, with the result that the torpedoing of the *Sussex* and other unarmed vessels drew something like an ultimatum from President Wilson (18th April). Germany agreed to his demand that merchant ships should not be sunk without warning, but her consent was only conditional. She knew that America's entry into the war was a danger not lightly to be risked while Britain remained in undisputed command of the sea. It might be averted if Germany

succeeded in recovering some freedom of action for her fleet. Hence the increasing need to deal a blow which, while it could not hope to destroy the main forces of the British Grand Fleet, might undermine what Admiral von Tirpitz, from 1897 to 1916 Secretary of State for the German Navy, afterwards described as Britain's monopoly of world supremacy at sea.

Admiral Scheer, who had succeeded to the command of the German High Seas Fleet in Jan., 1916, realized also that the pressure of the British blockade, which was leading to insistent calls in Germany for action, could only be relieved by naval success. In aiming at this in 1916 his object, in his own words, "was to draw the enemy away from his remote base to a place where the German fleet, notwithstanding the difference in numbers, need not shrink from accepting battle". He paved the way by a fresh raid on the East Coast on 25th April, when Lowestoft was bombarded by the German battle-cruiser squadron, which succeeded in escaping before its retreat could be cut off. The public outcry against such a raid being allowed to go unpunished led to the announcement that steps were being taken to prevent its repetition. Admiral Scheer accordingly planned a similar raid on Sunderland, hoping thereby to effect some diversion of the Grand Fleet which would give him the opportunity he sought. The raid was to be executed in conjunction with Zeppelins and U-boats, the temporary withdrawal of the submarines from attacks on merchant shipping, in consequence of President Wilson's note, having rendered sixteen of them free to participate in Scheer's new plan. The weather proved unfavourable, and the raid on Sunderland was abandoned; but the submarines were ordered to remain in position off the British naval bases until 1st June. This was the day following that on which Admiral Scheer intended to put into operation a revised plan, aiming at an attack against the trade in the Skagerrak, where the Peninsula of Jutland afforded shelter against surprise from the east. His object was to lure a portion of the British Grand Fleet to sea, and to fall on such ships as survived the U-boats lying in wait for them, with the full force of the High Seas Fleet.

As it happened, the whole of the British

Grand Fleet, which had been off the Jutland coast early in May supporting a British naval raid on the Zeppelin sheds at Tondern, in the vain hope of drawing the High Seas Fleet to sea, was being prepared for a more extensive operation in the Skagerrak itself on 1st June, having the same object in view. Thus, as Lord Jellicoe afterwards explained in *These Eventful Years* (1924), both the British and German Commanders-in-Chief were working for a meeting, the British Commander-in-Chief hoping to entice the entire High Seas Fleet to sea, and the German Commander-in-Chief anticipating the possibility of meeting separate divisions only of the Grand Fleet.

The battle itself, like many another historic victory, has been a subject of controversy ever since it was fought. It is only possible to deal briefly with it in the space at our disposal. Admiral Jellicoe was warned at noon on 30th May by the Admiralty that intercepted wireless signals pointed to the possibility that the High Seas Fleet was preparing to put to sea. The Grand Fleet accordingly set out from its Scottish bases between 9 and 10 that night, Sir David Beatty, with the battle-cruiser squadrons from Rosyth, being directed to meet the British battle fleet at the appointed rendezvous at 2 p.m. on the following day if he had sighted nothing. The German submarines which had been waiting to strike as the ships put to sea, were, it may be mentioned at once, entirely unsuccessful in their anticipated efforts.

The British fleet in all was constituted of 41 capital ships, made up of 28 battleships, 9 battle-cruisers, and 4 armoured cruisers. It had also its attendant suites of 'ancillary craft', consisting of 25 light cruisers and 77 destroyers. No British air-ships were attached, and only three submarines. The German fleet consisted of 27 capital ships, made up of 22 battleships and 5 battle-cruisers; there were also 11 light cruisers and 72 destroyers, as well as 22 submarines and 10 air-ships.

In gun-power the British capital ships were superior to the contemporary German ships. The German vessels, on the other hand, owing to their greater beam, were far superior both as regards armour and protection against torpedo attacks, the British ships being restricted in this respect owing to the width of existing

docks. "The resisting power of the German capital ships", wrote Lord Jellicoe in *These Eventful Years*, "is well indicated by the manner in which some of their battleships survived the battle of Jutland, in spite of receiving a very large number of hits from projectiles as well as damage by torpedo." The British Commander-in-Chief bore testimony also to the excellence of the German shell and delay-action fuses, which enabled the explosion of the shell to reach the magazines—whereas British shell burst before penetrating; and pointed out that German ships of all classes carried torpedo armaments considerably superior to corresponding British ships.

The German fleet set out from the Jade, the night near Wilhelmshaven, in the early hours of 31st May, the advance squadron, under Admiral Hipper, leaving at 2 a.m., and the main force, personally commanded by Admiral Scheer, half an hour later. Hipper's force, with its greater speed, was well ahead of the German battle fleet when it first came in contact with Beatty's force off the northern end of Jutland shortly after 2 p.m. on 31st May. The British battle-cruisers at once shaped course to cut the Germans off from their base, Hipper thereupon turning round from north to south to rejoin the enemy's main fleet. Beatty conformed to this course, considerably hampered by smoke and haze as the battle-cruisers on each side opened fire. The four battleships under Admiral Evan Thomas were too far away at this stage to join in, and could not get within range until 4.10 p.m. Meantime Beatty's and Hipper's battle-cruisers hammered away at each other in the southerly run which was bringing them nearer and nearer to the German battle fleet. *Queen Mary* and *Indefatigable* blew up in this phase of the battle, with the loss of practically all hands, shells from the German guns evidently reaching the magazines.

Five minutes after the guns of Evan Thomas's battleships came within range the destroyers on both sides attacked between the lines of opposing battle-cruisers, the German destroyers being beaten back after losing two of their number. Two British destroyers, *Nestor* and *Nomad*, were disabled and subsequently sunk by the oncoming German battle fleet, which was sighted at 4.40.



As soon as Beatty saw the main German fleet approaching he turned his four remaining battle-cruisers to the northward—Evan Thomas's four battleships following suit—in order to draw the enemy into the jaws of the Grand Fleet, which was between 50 and 60 miles distant from the battle-cruisers when the Germans were first sighted. Jellicoe's six battle divisions—unknown to the Germans, who at once turned in pursuit of Beatty—were meantime rushing south-east by south in an oblong of six lines of four ships each. Handicapped by conflicting reports and messages which placed the German fleet at 5 p.m. in four different positions at once, Jellicoe nevertheless held on at full speed until distant flashes of guns to the southward, and the sighting of Beatty's battle-cruisers, showed him that the German fleet was much farther to the westward than the reports had indicated, and much closer than anticipated. He was therefore forced to effect a more complicated deployment than he had premeditated in order to prevent his ships from hitting one another with their fire; and it was not until 6.30 that the Grand Fleet was in line.

Rear-Admiral Hood, who had been sent on ahead to reinforce Beatty with the 3rd Battle Cruiser Squadron, came under a devastating fire and perished with his flagship, *Invincible*, at 6.32 p.m., after severely damaging several of the enemy battle-cruisers. The 1st and 2nd Cruiser Squadrons came into action about the same time, driving in the enemy light cruisers, but also suffering heavy losses themselves as they groped their way through the mist. It was in this phase of the battle that the *Defence* was sunk, with Rear-Admiral Sir Robert Arbuthnot, commanding the 1st Cruiser Squadron.

The Germans, however, were being gradually overwhelmed as successive British squadrons joined in the fray, and von Scheer, with some of his ships lost and others more or less damaged, threw out a chemically created smoke-screen to turn to the westward with all his ships, away from the British line. This was at 6.40. Some twenty minutes later the fleets were again in contact, when Scheer, once more reversing his line, with the object, apparently, of striking the British rear, found himself instead opposite to the centre. His battle-cruisers at once came under

a crushing fire and turned sharply away. There was no longer any doubt in his mind that he was in fatal touch with the whole British fleet. Concealed behind another cloud of artificial fog, Scheer again turned his battle fleet to the west, saving it in the nick of time from a most perilous position. Passing round the wake of the British fleet in the darkness, he made for Horn Reef—his shortest route home—as hard as he could, leaving all his destroyers to be used for night attacks.

Unaware that the enemy had made this desperate bid for safety—for the Horn Reef route was his most dangerous passage back—Jellicoe fully expected a renewal of the battle next morning. Meantime night rendered fresh dispositions necessary on the part of the British Commander-in-Chief. "The value of the Grand Fleet to the Allied cause was far too great to be made the sport of chance," he writes in the account of the battle already quoted; and "would give the German fleet the opportunity to take advantage of the superior torpedo armament known to be possessed by both ships and destroyers, as well as of their more perfect defensive arrangements." He disposed the fleet for the night, therefore, with a view to its safety from such attacks, while providing for a renewal of action at daylight. Unfortunately the opportunity for renewal never occurred. Von Scheer had slipped clean away.

The losses on the British side, most of which occurred before the British battle fleet came into action, included three battle-cruisers, two armoured cruisers, and eight destroyers sunk in action, while one armoured cruiser foundered on her way towards her base. On the German side one battleship, one battle-cruiser, four light cruisers, and five destroyers were lost, while two of their battle-cruisers were so badly injured that they were lucky to reach home.

The German claim to victory was based on having inflicted greater material losses than they received, and the erroneous idea that the British Grand Fleet on the morning of 1st June was doing its best to avoid further action. Lord Jellicoe has proved that the movements of the Grand Fleet on 1st June were directed solely towards a renewal of the battle as soon as the German fleet could be located, and bases his claim to victory on the solid



# The BATTLE OF JUTLAND

May 31 - June 1, 1916

5th. Battle Squadron (Evan Thomas)  
to N.N.W. follows Battle Cruisers  
(First phase, May 31)

Engage at 3.45 p.m. 16-18,000 yards  
Enemy sighted, 3.32 p.m.

Battle Cruisers (Beatty)  
at 2.20 p.m.  
(First phase, May 31)

Battle Cruisers turn N.N.W. at 4.40 p.m.  
German Battle Fleet in sight

Main British Battle Fleet (Jellicoe)  
from N.N.W. comes into action  
about 6 p.m. May 31

Battle Cruisers cross head of  
German fleet about 6.26 p.m.

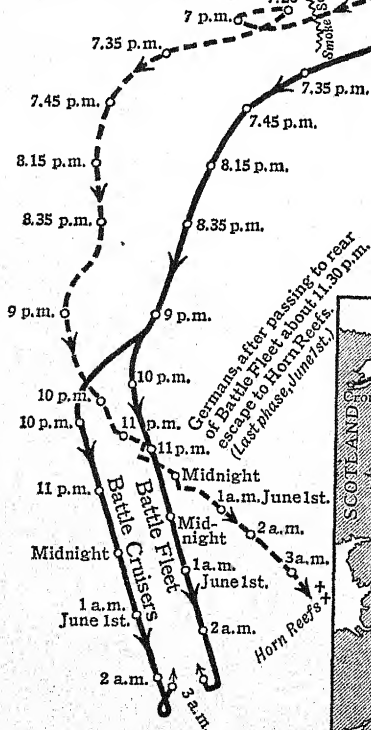
Hipper turns S.E. 3.33 p.m.

Germans turn south about 6.35 p.m.  
and set up smoke screen

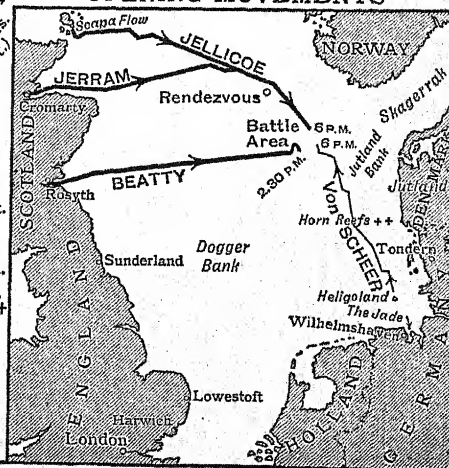
German ships (Hipper) sight Light Cruisers  
about 2.20 p.m.  
(First phase, May 31)

Hipper turns about 4.50 p.m., ahead of German  
Battle Fleet

German Battle Fleet (von Scheer)  
coming to support of Battle Cruisers  
about 4.40 p.m. May 31, joining forces  
with Hipper in pursuit of Beatty



## OPENING MOVEMENTS



fact that from the moment the British battle fleet appeared the High Seas Fleet manœuvred with the sole object of returning safely to its base. Moreover, in Admiral Jellicoe's own words:

"The German fleet only once left the vicinity of the Heligoland Bight after the battle of Jutland, viz. on August 19, 1916, and on that occasion Admiral Scheer, warned by his numerous airships stationed to the northward, that the British battle-fleet was at sea and steering to meet him, retired to his base long before the fleets were in contact. The next trip of the High Seas Fleet towards the British coast was for the purpose of surrendering."

Five days after the battle of Jutland—about 8 p.m. on 5th June, 1916—the cruiser *Hampshire* struck a mine off the Orkneys and foundered with Lord Kitchener and all but one or two of the crew. Lord Kitchener and his staff were on their way to Russia to discuss details regarding the next Allied offensive. The mine was said by the Germans to have been laid by one of their submarines.

For the rest of the war the German High Seas Fleet, as Lord Jellicoe pointed out, ran no risk above water of again seriously challenging Britain's sovereignty of the sea. In Nov., 1916, Jellicoe succeeded Sir Henry Jackson as First Sea Lord, and Beatty took over the command of the Grand Fleet. Germany again relied chiefly on her submarines to carry on the naval war. Risking rupture with America, and other neutrals whose shipping was thus exposed to wanton attack, she inaugurated 'unrestricted' U-boat war on 1st Feb., 1917. Thereupon President Wilson severed diplomatic relations, and on 5th April the United States formally declared war against her, Cuba, Panama, Brazil, and other neutrals following suit. The naval resources of the United States were at once placed at the Allies' disposal. Proof of the closeness of co-operation between the British and United States navies was afforded in June, 1917, when Vice-Admiral Sims, commanding the United States Naval Forces in European Waters, was given the command of the Irish station during the absence of Vice-Admiral Bayley on sick leave.

In addition to her submarine campaign, which exacted heavy toll in Allied tonnage every week, Germany carried out a number of destroyer and torpedo-boat raids in the Channel from Zeebrugge, bombarding Ramsgate, Broadstairs, and Margate

several times in the early months of 1917. On the night of 20th–21st April six German destroyers raided Dover, but were caught on their way back by the British destroyers *Broke* and *Swift*, which sent two of them to the bottom after a most gallant attack. This was one of the last opportunities which the British navy had of getting to close grips with the enemy, though the range of the submarine was extended as far as the American coast.

New methods were constantly being adopted to cope with this danger—including the employment of 'Q' boats or mystery ships—and with the help of American reinforcements the monthly shipping losses in the closing year of the war grew progressively less, while new tonnage under construction was as rapidly increasing. The last historic operations at sea were the heroic raids on Zeebrugge and Ostend. The object of the first, carried out under Vice-Admiral Sir Roger Keyes, was the blocking of the outlets of the German submarines and destroyers from their depot at Bruges. The old cruiser *Vindictive* covered herself with glory on both occasions. With the ferry-boats *Iris II* and *Daffodil* she shielded the blocking ships, and ran alongside the Mole at Zeebrugge on St. George's Day, 1918, to do what damage she could while an old British submarine, carrying out its instructions to the letter, rammed herself below the viaduct connecting Zeebrugge Harbour with the Mole, and blew herself up. The landing operations on the Mole were preceded by a bombardment from a squadron of monitors, and supported by a flotilla of destroyers and a fleet of motor craft. When the blocking ships had been completely blown up in the fairway at Zeebrugge, the battered *Vindictive* returned with her supports to Dover.

A simultaneous attack on Ostend had failed through the removal of a buoy, which caused the two blocking ships sent for a similar purpose to be sunk outside the harbour. Three weeks later the *Vindictive*, now patched up as a blocking ship, was employed in a second and this time successful attempt, being sunk 200 yards up the channel. Commander Godsal, who was in charge of both operations at Ostend, had barely completed his task when he was killed by a shell.

The last trip of the German navy

towards the British coast, as Lord Jellicoe has remarked, was for the purpose of surrendering. Under the terms of the Armistice 6 German battle-cruisers, 10 battleships, 8 light cruisers, 50 destroyers, and all her submarines were surrendered, the bulk of them to the Grand Fleet at Rosyth, under Sir David Beatty, on 21st Nov. On the following day the captive ships were sent to Scapa Flow, where, exactly seven months later, while the British battle fleet was absent on gunnery practice, practically every vessel was scuttled by its German crew.

### *The Colonial Campaigns*

Before the war was many weeks old it had extended to the far ends of the earth, wherever Germany ruled. Japan, true to her alliance with Great Britain, declared war on 23rd Aug., and attacked Tsingtao (in Kiaochow, q.v.), 'the key to Northern China' and a formidable naval base in the Far East, which Germany seized in 1898. Tsingtao had a garrison of 6000 troops, but capitulated on 7th Nov. to the Japanese expeditionary force under General Kamio, 30,000 strong, supported by a small contingent of South Wales Borderers and Sikhs under General Barnardiston. Japan at the same time sent a squadron to help in the seizure of the German possessions in the Pacific, the more northerly of these islands, after

campaigning that the subsequent expedition under General C. M. Dobell, operating in conjunction with French troops under General Aymerich, succeeded in finally clearing the Cameroons of the enemy, who then fled into the adjoining territory of Rio Muni, belonging to Spain.

In German South-West Africa the campaign was held up for a time by the revolt of Maritz—commanding the defence forces in the north-west of the Cape Province—which led to small insurrections in South Africa that had to be suppressed before General Botha could concentrate on the task which he had undertaken in proof of the Union's loyalty. Within a few weeks of the outbreak of war the first move in this direction had been made by the seizure of Luderitz Bay by the South African force, the Germans retiring on their capital inland—Windhoek. With the spring of 1915, and the German intrigues in the Union brought to naught, Botha was able to begin his decisive advance with columns of converging troops, consisting chiefly of mounted burghers from the Transvaal and the Orange Free State. Everywhere the Germans were outmanœuvred in a campaign which called for the highest qualities of courage, endurance, and generalship. Karibib was occupied on 5th May, and Windhoek on the 12th. By this time the enemy, some 5000 strong but greatly outnumbered, had withdrawn

the end of 1914, under General Aitken, made a luckless attempt to land in the difficult bush country at Tanga with the object of cutting off the enemy troops operating on the British border. The adventure cost us 800 casualties before the expedition re-embarked. Several blockade runners succeeded in getting through to von Lettow-Vorbeck with fresh supplies of arms and ammunitions, and the German leader continued to threaten the British East African frontier by capturing the port of Jassin on 19th Jan., 1915. Apart, however, from seizing two of his chief ports on Lake Victoria and Lake Nyasa, Britain was now too fully occupied in more important theatres of war to take the problem seriously in hand herself. The task was left to the Union of South Africa, which loyally undertook it as soon as Botha had completed the conquest of South-West Africa. The command in East Africa then fell to Botha's right-hand man, General Smuts, who launched his campaign in May, 1916, driving von Lettow-Vorbeck's columns from the neighbourhood of the British frontier into the centre of the German colony by vigorous manœuvring round the enemy's flanks. By 7th July Smuts was in possession of Tanga, the scene of the disaster to Aitken's force, and occupied the capital, Dar-es-Salaam, on 2nd Sept. All the railways and ports were captured before the end of the year. At the beginning of 1917, when it only remained to clear up the remnants of the enemy, Smuts left for Great Britain to take part in an Imperial Conference. He was succeeded by General Hoskins, who was presently called away in turn to another theatre of war, the command then falling to General van Deventer.

The nature of the country made it extremely difficult to capture the elusive von Lettow-Vorbeck, though General Northey's column helped in the converging movement from Rhodesia, while Belgians advanced from the Congo along the Central Railway, and Portuguese joined in the movement from the extreme south. Von Lettow-Vorbeck at length slipped into Northern Rhodesia, and was being finally rounded up there when news arrived of the Armistice. On tendering their submission the German leader and his officers were allowed by van Deventer to retain their swords in recognition of

their 'gallant and prolonged resistance'.

### *The Turkish Campaigns*

In the early days of the war, as pointed out on p. 44, a secret treaty had been concluded between Germany and Turkey—then largely in the hands of the militant Young Turks, headed by Enver Pasha—but it was not until early in Nov., 1914, when their designs could no longer be disguised, that hostilities actually began between Turkey and the Allies. New military problems were at once created for Britain in Egypt, where the Turks hoped to regain their ancient control; and in Mesopotamia, where Germany sought to realize her dream of the Berlin to Baghdad railway, with all its imperial implications in the direction of India; and where Britain had need, also, to secure her indispensable supplies of oil in the Persian Gulf. For Russia it meant an immediate extension of the war into the Caucasus, where, however, the opening campaign, under Enver Pasha, ended in the crushing defeat of the Turkish army in the battle of Sarikamish and the occupation of Erzerum by the Russians.

In Egypt, the pro-German Khedive of which, Abbas II, was deposed in his absence, a futile attack by the Turks on the Suez Canal on 2nd Feb., 1915, was defeated. The threat, however, remained, and strengthened the argument in favour of a lethal thrust at Constantinople by way of the Dardanelles. This, it was urged, would serve as the surest measure for Egypt's defence, and at the same time open a road to the Black Sea, by which much-needed help could be sent to Russia. With the deadlock which had been reached on the Western front there was a good deal to be said for the Dardanelles scheme, but divided counsels among the opposing Eastern and Western schools of thought robbed the plan of whole-hearted support, and led to embittered controversies which continued long after the war.

When the first attacks on the Dardanelles—began on 19th Feb., 1915, and renewed on 25th Feb., 6th March, and 18th March, by a combined British and French fleet—were finally repulsed, after destroying the outpost forts at the cost of two British battleships (*Irresistible* and *Ocean*) and one French (*Bowet*), it was impossible to draw back without dangerous

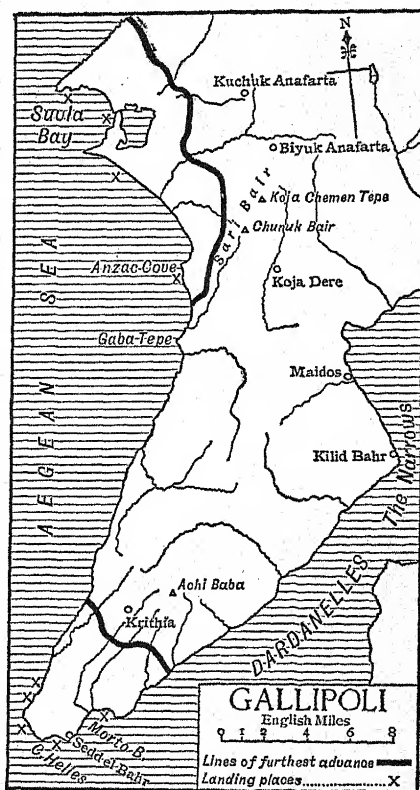


loss of prestige. A combined naval and military attack was accordingly ordered, but this could not be launched until 25th April, by which time the Turks, fully warned, and efficiently led by the German general, Liman von Sanders, had organized defence systems at every vital point of the Gallipoli Peninsula, thus robbing the Allies of all but the faintest prospect of success.

The British Expeditionary Force, comprising the 29th Division, the Australian and New Zealand Corps (Anzac), the East Lancashire Territorial Division, and part of the Royal Naval Division, was commanded by Sir Ian Hamilton, a less numerous French Colonial Division being in charge of General d'Amade. The French troops made a feint attack on the other side of the Narrows while the landing, with almost incredible gallantry, was being effected by the British troops on 25th April. Several beaches were carried round the nose of the peninsula, while the Anzacs won their precarious foothold farther north, near Gaba Tepe. Three days later the French corps was brought across to join in a general advance aiming at the conquest of the peninsula's extremity, but the battle of Krithia, which resulted, was only the beginning of a series of costly struggles against practically impregnable positions. Only local advances were made both here and at Anzac, where the Australian and New Zealand troops were commanded by General Birdwood. At sea we lost three more old battleships, but British submarines did gallant work in the Straits, where they torpedoed a Turkish battleship, gunboats, and a number of transports.

Another landing was effected at Suvla Bay during the night of 6th-7th Aug., by the 9th Corps under General Sir F. Stopford, with the object of co-operating in a fresh offensive with the Anzac Corps. The Anzac columns, which included Gurkhas and English regiments, advanced towards the commanding ridges at Koja and Chunuk while the new force was landing. They failed, however, to reach their final objectives, a contributory cause being the fatal delay in the attack on the part of the Suvla Bay troops, due to misunderstandings amongst generals, lack of water, and inexperience. General Stopford was succeeded by General de Lisle on 15th Aug., but Lord Kitchener

declined to risk further reinforcements. Sir Ian Hamilton made another attempt to win through by bringing the 29th Division up to Suvla, with the addition of Yeomanry, but without success, and by the end of August the campaign had settled down to the dreary siege warfare of the Western front. On 15th Oct. Sir



Ian Hamilton was recalled, and Lord Kitchener, who made a personal inspection of the positions, supported Sir Charles Monro's advice to withdraw the expedition as soon as possible. After casualties amounting in all to 31,389 killed, 78,749 wounded, and 9708 missing, the evacuation was carried out with extraordinarily few losses—Anzac and Suvla Bay on 19th Dec., and Cape Helles on 8th Jan. (1916). While the Gallipoli campaign was



running its disastrous course, the expedition in Mesopotamia was pursuing its chequered career in the direction of Baghdad. After securing the oil-fields in the Persian Gulf at the opening of the campaign, the small British force originally sent out occupied Basra on 22nd Nov., 1914, and presently grew to the strength of a division, under General Sir John Nixon, with outposts at the junction of the Tigris and Euphrates. Following a Turkish attack, the British expedition, co-operating with a Russian advance towards the headwaters of the Euphrates, pushed forward to Shu'aiba, taking Al Qurnah on 31st May, 1915. Three days later General Townshend captured Amara, on the Tigris, while General Gorringe, with another column, defeated the Turks at An Nasiriya on the Euphrates, on 24th July.

These successes encouraged General Nixon to order a further advance to Kut, which Townshend carried after a brilliant victory over the Turkish forces defending that town on 28th Sept., 1915. Against his sounder advice—but with the object of counteracting as far as possible the effects in the East of our failure in Gallipoli—Townshend was now given the hazardous task of marching his slender and mixed force of British and Indians against the Turkish base of Baghdad. The result was the battle of Ctesiphon (22nd Nov.), where the Turks awaited the British in their advanced position. Townshend carried the first line of their defences, driving the Turks headlong from the field; but the enemy, after retiring on their supports, and reinforced by troops newly arrived from Europe, fell on the victors with such strength that Townshend, on 25th Nov., was forced to retreat to Kut (3rd Dec.), fighting rear-guard actions all the way, and suffering severely. The Turks made two attempts to carry the town by storm, but, beaten back each time, proceeded to starve it out. The siege, endured by Townshend's troops with heroic devotion, lasted for 145 days. Finally, on 29th April, 1916—following the failures of successive attempts to relieve Kut made by the expedition under Generals Aylmer and Younghusband—the garrison surrendered to Khalil Pasha.

In Aug., 1916, the command of the Mesopotamian campaign was given to General Stanley Maude, who, profiting by previous mistakes, and inspired by

sound generalship and a rare gift for organization, proceeded to put an entirely different complexion on affairs. He cleared the right bank below Kut by 15th–16th Jan. (1917), and wrested Kut itself from the Turks by 23rd Feb. By 11th March he had forced them out of Baghdad, scattering the enemy in all directions.

There was at one time a hope that Maude's troops would be able to join hands with the Russians on the Persian frontier of Mesopotamia. The Grand Duke Nicholas, since his appointment as Viceroy of the Caucasus on leaving the command of the main Russian armies to the Tsar, had achieved a series of substantial successes against the Turks with the army under General Yudenitch. After capturing the fortress of Erzerum early in 1916, he had occupied the port of Trebizond and driven the Turks later in the year from Bitlis and Minsk. Troops were also sent to the Persian frontier to co-operate with the British advance in Mesopotamia, but all hope of help from this direction was destroyed by the Russian Revolution, under which the Russian campaign in Turkey collapsed.

The British victory at Baghdad, nevertheless, was followed by subsequent successes at Ramadie, on the Euphrates (28th Sept.), the Turkish commander of which was captured with 3400 prisoners, and at Tekrit and the Jebel Hamrin hills shortly before the death of Sir Stanley Maude from cholera (18th Nov., 1917). His successor, General Marshall, pushed on to Hit, on the Euphrates (9th March, 1918), and brought the campaign to a triumphant close just before the Armistice with a decisive victory at Mosul.

The Palestine campaign was the sequel to the Turkish offensive against Egypt, inaugurated, as already mentioned, by the futile attempt by the Turks to force the Suez Canal in Feb., 1915. When the British evacuated Gallipoli at the end of that year the Turks revived their Egyptian plans on a more ambitious scale. Advancing from El Arish with a well-equipped Turko-German force of 18,000 troops under von Kressenstein, they attacked Major-General Lawrence's positions at Romani on 3rd Aug., 1916, but were beaten off after suffering heavy losses. Their casualties were heavier still in General Sir A. Murray's counter-attack, in which

some 4000 prisoners and 4 guns were taken. Another striking success was scored on 22nd Dec. of the same year, when Magdhaba was carried by one of the desert columns and the entire Turkish force of 3000 captured or destroyed.

Steadily continuing his advance towards the Turkish lines on the southern frontier of Palestine, with the columns under Dobell and Chetwode, General Murray arrived within striking distance of Gaza on 26th March, 1917. The first attempt to carry that strongly fortified town failed after two days' hard fighting. The second attempt, on 19th April, met with no better success. General Murray was replaced by Sir Edmund Allenby, who was sent from France to organize a fresh campaign with reinforcements. It was necessary to pin as many Turks to this theatre as possible. Otherwise, with the collapse of Russia, they would make a desperate effort to turn Maude out of Baghdad. The summer was spent in carefully planning and improving communications; and on 31st Oct., 1917, taking the Turks by surprise, Allenby first turned their left flank by capturing Beersheba, and then rolled up their lines until Gaza fell into his hands on 7th Nov.

Following up this victory, he pursued the enemy through Ascalon (9th Nov.) to Jaffa (16th Nov.). Again defeating the enemy with his main columns among the hills of Judea, he received the surrender of Jerusalem on 9th Dec. In the spring of 1918, after the Jordan had been crossed, operations were practically suspended through the recall of some of Allenby's best British divisions—to meet the final crisis on the Western front—until Indian divisions had taken their place and completed their training. The interrupted campaign was renewed on 19th Sept., when Allenby broke through the Turkish lines north of Jerusalem so successfully that his cavalry were able to sweep round the enemy's flank and close every avenue of escape on the western side of the Jordan. On the eastern side retreat was cut off by the co-operating Arabs of the Hejaz, organized by the Emir Feisul and Colonel T. E. Lawrence. In less than a week three Turkish armies were wiped out, and by the end of October, when Allenby entered Aleppo, the conquest of Palestine was complete. By this time, however, Turkey had already acknowledged defeat. Ne-

gotiations were begun at Mudros, and on 30th Oct., having agreed to the Armistice terms, Turkey dropped out.—BIBLIOGRAPHY: *The Times History of the War*; F. A. Mumby and Others, *The Great World War*; Sir Julian Corbett, *The Official History of the War: Naval Operations*; Brigadier-General J. E. Edmonds, *The Official History of the War: Military Operations*; A. F. Pollard, *A Short History of the Great War*; Earl of Ypres (Sir John French), *Despatches*; Earl Haig, *Despatches* (edited by Lieutenant-Colonel J. H. Boraston); Earl Jellicoe, *The Grand Fleet, 1914-16*; John Masefield, *Gallipoli*; Theobald Bethmann-Hollweg, *Reflections on the World War*; General Ludendorff, *My War Memories, 1914-1918*; Marshal von Hindenburg, *Out of My Life*; Various writers, *These Eventful Years*.

Eurydice, in Greek mythology, the wife of Orpheus (q.v.).

Eusebius, of Cæsarea (c. 260-c. 340), ecclesiastical historian. About 315 he was appointed Bishop of Cæsarea. His ecclesiastical history (*Historia Ecclesiastica*) extends from the birth of Christ to 324. Amongst his other extant works is a life of Constantine the Great.

Eustachio, Bartolomeo (c. 1500 - c. 1574), Italian physician and anatomist. Amongst his discoveries were the eustachian tube and the eustachian valve of the heart.

Eutropius, Flavius (c. A.D. 360), Latin historian. His abridgment of the history of Rome is written in a perspicuous style, but is of little or no authority as a history.

Eutyches (c. 380-456), Greek heresiarch. His followers were often called Monophysites (q.v.).

Euxine, the ancient name for the Black Sea (q.v.).

Evans, Sir Arthur John (1851- ), British archaeologist. He has made important investigations and discoveries in Crete. He has travelled in Finland, Lapland, and the Balkan countries, and has written works connected with these travels and with his archaeological researches. Among his works are: *Through Bosnia, Scripta Minoa*, and *The Palace of Minos*.

Evans, Sir George de Lacy (1787-1870), British general. He served with distinction in India, the Peninsula, and America. In 1835 he was appointed to the command of 10,000 troops raised in Britain on behalf of the Queen of Spain. During the Crimean War he distinguished himself as com-

mander of the second division of the British army.

Evans, Sir John (1823–1908), English archaeologist. His chief works are: *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain and Ireland*; and *The Ancient Bronze Implements, Weapons, and Ornaments of Great Britain and Ireland*.

Evanston, a city of the U.S.A., Illinois, on Lake Michigan. It is the seat of the North-Western University and other institutions. Pop. 37,234.

Evansville, a town in the U.S.A., in Indiana, situated on a height above the Ohio. Coal and iron abound in the vicinity, and there are numerous factories, flour-mills, and iron-foundries, and a large shipping trade. Pop. 85,264.

Evaporation, the process by which a liquid changes into vapour. When evaporation takes place into a closed space above the liquid, a state is reached in which the space is saturated with vapour, and no further change is apparent. Evaporation is always accompanied by an absorption of heat by the vapour, namely the latent heat necessary for the change of state. This heat is abstracted from the liquid, and neighbouring bodies may also be cooled; hence the danger of a chill after a wetting. In hot countries, water is kept cool by being placed in porous earthenware jars. Evaporation is the cause of the presence of water substance in its various forms in the atmosphere. The cooling caused by evaporation is applied in industry in refrigerating plant.

Evelyn, John (1620–1706), English diarist. He published numerous works, amongst which are: *Sculptura, or the History and Art of Chalcography*; *Sylva, or a Discourse of Forest Trees*; treatises on gardening and architecture. But by far his most important work is his memoirs, comprehending a diary and correspondence, which are interesting contributions to the history of the time. The diary was first published in 1818.

Evening-primrose (*Oenothera*), a genus of plants, nat. ord. Onagraceæ. *O. biennis*, an American species common in cottage gardens, is not infrequent as an escaped plant in England.

Everest, Mount, a mountain in the Himalayas, on the boundary between Nepal and Tibet, the loftiest summit in the

world. It is named after the Surveyor-General, Sir George Everest, who was responsible for the triangulation of the mountain in 1849, and is 29,141 feet high. The idea of climbing Everest first occurred to the Hon. C. G. Bruce and to Sir Francis Younghusband in 1893, but political and other difficulties prevented the scheme coming to fruition. In 1921, however, as a result of Major Noel's exploration of the eastern approaches to the mountain in 1913, a reconnaissance expedition was sent out by the Royal Geographical Society and the Alpine Club, and General Bruce took out a climbing party the following year. This party approached Everest from the East Rongbuk Glacier in Tibet. Three members reached 28,800 feet without oxygen, and two members and a Gurkha, using oxygen, attained a height of 27,200 feet. In 1924 General Bruce again took an expedition to attempt the assault. The route followed was practically the same as in 1922. Two members, Norton and Somervell, reached 28,000 feet without oxygen, and a few days later G. H. Leigh Mallory and A. C. Irvine set out to make the final effort to reach the summit. They had oxygen, and were last observed at a height of over 28,200 feet. They failed to return, and such search as was possible showed no traces of them. Whether they reached the top or not is a matter of speculation—that it ultimately will be reached is a matter of certainty.—Cf. Younghusband, *The Epic of Everest*.

Everett, a city, Massachusetts, U.S.A. The main industries are ironfounding and the manufacture of steel. Pop. 40,120.

Everett, a city of Washington, U.S.A., 34 miles north of Seattle, on Puget Sound. It has an excellent harbour, and trades largely in timber and in minerals. Pop. 27,644.

Everlasting-flowers, flowers of the genus *Helichrysum* and its allies, which are little changed in appearance when dried.

Everlasting-pea, a popular name for *Lathyrus latifolius*, belonging to the same genus as the sweet-pea.

Evesham, a borough in England, Worcester, situated on the Avon. It was the seat of a monastery as early as the eighth century. Pop. (1931), 8799.

Eviction, the dispossession of a person from the occupancy of lands or tenements.

The Rent Restrictions Act, 1920, originally operative until 1923 and subsequently extended until Dec., 1928, severely curtails a landlord's common law rights to recover possession of certain premises at the time when, but for the Act, the tenancy would expire.

**Evidence.** The following are the leading rules regarding evidence in a court of law:

(1) The point in issue is to be proved by the party who asserts the affirmative. But where one person charges another with a culpable omission this rule will not apply, the person who makes the charge being bound to prove it. (2) The best evidence must be given of which the nature of the thing is capable. (3) Hearsay evidence of a fact is not admissible. The principal exceptions to this rule are—death-bed declarations, evidence in questions of pedigree, public right, custom boundaries, declarations against interest, declarations which accompany the facts or are part of the *res gestæ*, &c. (4) Insane persons and idiots are incompetent to be witnesses. But persons temporarily insane are in their lucid intervals received as witnesses. Children are admissible as witnesses as soon as they have a competent share of understanding and know and feel the nature of an oath.

**Evil Eye**, a power which, according to an old and widespread superstition, resides in some people of doing injury to others by a mere look, or a look accompanied by certain words or charms. This belief is still prevalent among the more ignorant classes in Italy, Russia, Andalusia, the Highlands of Scotland, and other places.

**Evolution**, a term now used in biology for the process by which more complex plants or animals have been derived from a series of less specialized ancestors by transformation. In accordance with the teaching of modern biology, all living creatures are the progeny of one original group of microscopic unicellular organisms, different branches of which during many millions of years have become diversely modified in structure and function to form the vast multitudes of diverse species of plants and animals with which we are acquainted.

The evidence that establishes the proof of evolution is of manifold kinds. Large groups of species of widely different habits present the same fundamental plan of

structure; and parts of the same animal or plant, the functions of which are very different, likewise exhibit modifications of a common plan. Structures are found in a rudimentary or apparently useless condition in one species of a group which are fully developed and have definite functions in other species of the same group. Such considerations, according to Huxley, when studied in conjunction with the facts of the geological succession of the forms of life, of geographical distribution, and the effects of varying conditions upon living organisms, establish the truth of evolution.

The fact that man has a vertebral column, a brain and nervous system, a heart and blood-vessels, digestive and other systems of organs, built up in accordance with the arbitrary plan which is shared also by all mammals, birds, reptiles, amphibians, and fishes, proclaims that man belongs to the vertebrate group of animals, and that all such vertebrata must originally have sprung from the same common ancestors. All the four-limbed creatures or Tetrapoda represent one group which must have developed from some fish-like ancestor to become an amphibian. The discovery of fossilized remains of extinct animals reveals that the fishes are much older than the amphibians, that the reptiles came definitely later than the amphibians, and that only one small group of very primitive amphibians shared in the progressive modifications of brain, limbs, and organs of circulation, &c., to become reptiles—creatures able to live wholly on the dry land, and capable of a wider range of activities than the Amphibia. From the primitive reptiles were derived not only the highly specialized forms that have survived to the present day as lizards, tortoises, snakes, &c., creatures that differ profoundly from their earliest reptilian ancestors, but also the ancestors of birds and the ancestors of mammals. Different mammals have been specialized in structure for amazingly varied modes of life, on land, under the ground, in trees, in the air, or in rivers or the sea. The group of mammals which delayed the time of specialization until it was able to profit by its greater adaptability was the Prosimiae, the ancestors of the apes and man. These small creatures for a long time lived a life of obscurity in trees without submitting to those extreme



adaptations of structure which are found in most arboreal and flying mammals. But the cultivation of their powers of vision, and the acquisition of skill in the use of their primitive but plastic hands, guided by vision, eventually conferred upon some of these Prosimiæ vastly enhanced powers of skilled action and of learning by experience and of acquiring knowledge, which culminated in the attainment of the supreme power of discrimination distinctive of human intelligence.

The fact that man belongs to the same order (Primates) as the apes is proved not merely by the possession of a body which in most respects is identical in structure with such of them as the gorilla and the chimpanzee, but also by the fact that the blood of man and the apes react towards one another as those of relatives, and in a way not shared by the blood-reactions of other mammals. The apes, also, are subject to certain human diseases from which other mammals are immune. Man shares with the anthropoid apes (gorillas, chimpanzees, orangs, and gibbons) so many peculiarities which differentiate all of them from the tailed monkeys that there can be no doubt that the human family was derived from a primitive anthropoid ape, possibly a species that lived in the foothills of the Himalayas in Miocene times.

Bibliographical references to most of the matters mentioned in this article will be found in the Presidential Address to Section H of the British Association, Dundee meeting (1912). Cf. *Evolution in the Light of Modern Knowledge, a Collective Work* (Blackie & Son).

Evora, a town in Portugal, capital of the province of Alemtejo, 75 miles east of Lisbon. It has a Roman aqueduct still serviceable, and a Gothic cathedral. Pop. 16,148.—The district of Evora has a pop. of 153,239, and an area of 2856 sq. miles.

Evremond. See *St. Evremond*.

Evreux, a town of North-West France, capital of the department of Eure, in a fertile valley on the Iton. It has an ancient Gothic cathedral. Pop. 18,950.

Examiner of Plays, a British official and censor of plays, who acts for the Lord Chamberlain, under whose jurisdiction the theatres are placed. No play can be produced without the sanction of the examiner, to whom a copy of every new

play intended for production must be sent seven clear days before the first performance. The examiner frequently insists upon an alteration of the text.

Excavation, the process of removing soil or rock in engineering or exploration works, such as for docks, retaining-walls, railway cuttings, canals, foundations, &c. On a small scale, or in situations unsuitable for machinery, it is performed by hand, the soil being first loosened by the pick, and then shovelled into barrows. In rocky soils, drilling and explosives may be employed. In large works, power shovels or 'steam-navvies' are employed, which are essentially cranes carrying a large shovel, or a system of steel buckets of the dredger type. These carry their own means of propulsion, and run on temporary rails laid down as the work proceeds. They work against the face of the excavation, and load directly into bogies or wagons.

Excavations. During the latter years of the nineteenth and the early years of the present century, excavators, philologists, and ethnologists have provided a fairly continuous and detailed history of man from 3000 B.C. till classical times. The most dramatic excavations were those begun by Heinrich Schliemann in 1871 at Hissarlik, the site of ancient Troy. He afterwards excavated at Mycenæ and Tiryns in Greece and found evidence of a high pre-Hellenic culture. Following up the clues thus afforded, Sir Arthur Evans and others, excavating in Crete during the opening years of the present century, discovered abundant relics, including palaces and towns, of the earliest Ægean civilization now referred to as Minoan (see *Crete*). In the Americas the excavators have thrown considerable light on the pre-Columbian civilizations of Peru, Central America (Maya), and Mexico.

Excess Profits Duty, devised in 1915 to meet the extraordinary expenditure occasioned by the war, was a tax upon the profits of certain trades and businesses carried on in the United Kingdom, or owned or carried on abroad by persons resident in the United Kingdom, in so far as these profits, after deduction of a specified allowance, exceeded a pre-war standard. 'Munitions Levy' (abolished in 1916) was the counterpart of Excess Profits Duty in its application to Government controlled establishments for the production of munitions of war.



In the fiscal year 1919-20 the tax and levy produced £290,045,000, and in 1930-31 the Excess Profits Duty and the Corporation Tax produced £3,000,000.

**Exchange**, in commerce, that species of transactions by which the debts of individuals residing at a distance are cancelled by order, draft, or bill of exchange, without the transmission of specie. Thus, a merchant in London who owes £100 worth of cotton goods in Glasgow gives a bill or order for that amount which can be negotiated through banking agencies or otherwise against similar debts owing by other parties in Glasgow who have payments to make in London. The creditor in Glasgow is thus paid by the debtor in Glasgow, and this contrivance obviates the expense and risk of transmitting money. The process of liquidating obligations between different nations is carried on in the same way by an exchange of foreign bills.

**Exchequer**, in Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England to account of the Exchequer, and these receipts as well as the necessary payments for the public service are under the supervision of an official called the Comptroller and Auditor-General. The Chancellor of the Exchequer, who must be a member of the House of Commons, is the head of the Treasury Department. He is the principal finance minister of the British Government, and the office is sometimes held along with that of the First Lord of the Treasury. The Chancellor of the Exchequer has a salary of £5000.

**Exchequer**, Court of, an ancient English court of record, established by William the Conqueror, and intended principally for the care and collection of the royal revenues. This court was abolished by the Judicature Act of 1873, and its jurisdiction transferred to the High Court of Justice.

**Exchequer Bills**, bills of credit issued by authority of Parliament as a means of raising money for temporary purposes. These bills pass from hand to hand as money, and form part of the public unfunded debt of Great Britain. *Exchequer bonds* are similar, but they run for a definite number of years (six at most) at a fixed rate of interest.

**Excise**. Excise duties were introduced into England by the Long Parliament in 1643. Being found to be a convenient and productive source of revenue, they continued to gain ground, and in 1929-1930 yielded £127,500,000 in Great Britain and Northern Ireland. In Britain the excise includes duties on spirits and beer, licences on dogs, guns, carriages, servants, plate, railways, game, &c.

**Excommunication**, the exclusion of a Christian from the communion and spiritual privileges of the Church. Excommunication was a recognized penalty among the Jews (*John*, ix, 22), and was practised early by the Christian Church. Besides excommunication an extreme degree of denunciation called *anathema*, and cutting the offenders off from all the hopes and consolations of the Christian faith, is used in the Roman Catholic Church.

**Exe**, a river of England, which rises in Exmoor, and falls into the English Channel at Exmouth.

**Executor**, in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the English law, appoint any person of sound mind and discretion. In Scotland an executor appointed by will is styled executor *nominate*, and by authority of the court executor *dativo*.

**Exeter**, a county of a city and river-port of England, county town of Devon, on the Exe, 10 miles from its outlet in the English Channel. The chief architectural feature is the cathedral (founded in 1112), a long, low building with fine west front, unique in having two towers forming its transepts, and only these two. There are iron-foundries, works for agricultural implements and paper, and 'Honiton' lace is made. By a canal vessels of 350 tons can reach the city. The largest vessels remain at Exmouth. Pop. (1931), 66,039.

**Exhibitions**. The first European exhibition was held at Venice in 1268; while the great fairs of Leipzig and Nijni-Novgorod partook of the same nature. But the real forerunner of the modern exhibition was that held in London by the Society of Arts in 1756. This was followed in 1761 by an exhibition of agricultural machinery. The first International or 'Great' Exhibition was held in 1851. Its success gave

the exhibition movement an impetus which produced examples at New York and Dublin (1853); at Munich and Melbourne (1854); Paris (1855); and at South Kensington, where was held the second International Exhibition (1862). Five years later came the great Paris Exhibition. In 1878 Paris held another exhibition, for which the Trocadero was built. The Paris Exhibition of 1889 was notable for the 'side-shows', which included the Eiffel Tower. London organized the Franco-British Exhibition in 1908. This last owed much to the late Imre Kiralfy, who had directed many previous displays, and was the designer of the 'White City' at Shepherd's Bush, where in 1914 was held the Anglo-American Exposition. After the European War the value of trade exhibitions came to be recognized, with the result that with each succeeding year exhibitions became more numerous. In 1924 and 1925 the great British Empire Exhibition was held at Wembley, near London, and attracted over 24,500,000 visitors. The exhibition covered 216 acres of ground, and afforded a comprehensive but complete survey of the whole Empire. The British Industries Fair (promoted by the Government) is held annually in London and Birmingham.

Exmoor, a wild and hilly district of England, in the extreme south-west of Somersetshire, extending also into Devonshire, formerly a forest.

Exmouth, Edward Pellew, Viscount (1757-1833), British admiral. In 1782 he was made a post-captain for a brilliant action in the *Pelican*, and on the outbreak of the war in 1793 was appointed to the command of the frigate *La Nymphe*. From this time till the peace in 1802 he was employed on active service. In 1804, on the resumption of hostilities, he was sent to take the chief command on the East India station. His next appointment was the command of the fleet blockading the Scheldt. In 1816 he was sent with a fleet to punish the Dey of Algiers for outrages committed. Along with some Dutch war vessels he bombarded the city for eight hours, and inflicted such damage that the Dey agreed to every demand.

Exmouth, a town of England, in Devonshire, at the mouth of the Exe. It is one of the best-known sea-bathing places on the Devonshire coast. The

chief industries are lace-making and the fisheries. Pop. (1931), 14,584.

Exobasidiineæ, a family of parasitic basidiomycetous Fungi, of which the commonest British species is *Exobasidium Vaccinii*, which is frequent on cowberry (*Vaccinium Vitis-Idæa*) in Scotland. *E. veauxii* is the cause of a serious disease of the tea-plant called 'blister-blight'.

Exodus, the name given in the *Septuagint* to the second book of the *Pentateuch*, because it describes the departure of the Israelites from Egypt. The contents of the book are partly historical, and partly legislative, describing the promulgation of the Sinaitic law.

Exogamy, a term applied to the custom of allowing marriages only between members who do not belong to the same group. Exogamy, which among other causes may be ascribed to a desire of forming useful alliances with hostile tribes, is practised among Australian aborigines, Mongols, and American Indians, and the custom is widely distributed in various forms in all stages of civilization.

Exorcism, the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient Church that certain persons, those particularly who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism*.

Expansion, in physics, the increase of the dimensions of a body caused by a change of temperature. For example, the coefficient of linear expansion of iron is 0.000011; that is, a yard, say, of iron rod becomes longer by this fraction of a yard for each degree centigrade that its temperature is raised. The coefficient of volume expansion of a solid is three times its linear coefficient. Fused silica or quartz expands so slightly that it may be plunged when red-hot into water without being cracked. Invar, a nickel-steel alloy, which also has an extremely small coefficient of expansion, is used in making clock pendulums which are unaffected by change of temperature. The expansion of water with rise of temperature is irregular; water contracts from 0° to 4° C., and thereafter expands at an increasing rate until the boiling-point is reached.

Expectation of Life. See *Mortality, Law of*.

**Exploits, River of,** a river which traverses nearly the whole of Newfoundland from south-west to north-east, and falls into the Bay of Exploits. It is about 150 miles long, and is navigable for steamers for 12 miles.

**Explosives.** An explosive is a substance or mixture of substances which, by the action of a blow or of heat, can be converted very easily and suddenly into a more stable substance or substances, usually gaseous, with the simultaneous liberation of a large amount of heat. Explosives are divided into classes according to the uses to which they are put, but the line of demarcation is not always very clear. The industrial and blasting powders may be either low or high explosives. A 'low' explosive explodes by the application of heat, and burns more or less uniformly and slowly, and projects neighbouring objects to a distance. A 'high' explosive explodes under a blow, and the whole of the substance is instantly transformed, and instantly exerts its maximum pressure, creating a violent disturbance in a limited area without necessarily projecting substances to any great distance. Service explosives, for naval and military purposes, are divided into propellants and high explosives. Sporting powders are specially modified propellant powders. Examples of these classes of explosives, with notes on their composition, are given below.

**Low Explosives.**—The best examples of the low explosive are gunpowder and similar mixtures. The constituents of the 'gunpowder' explosives are generally not explosive alone, but only when mixed. A 'gunpowder' mixture contains carbon or carbonaceous matter like wood-meal, hydrocarbons, starches, and sugars, &c., which burn owing to the presence of highly oxygenated substances like peroxides, chlorates and perchlorates, nitrates, permanganates, chromates and dichromates, all of which convey the necessary oxygen. In addition, there usually is present some very easily ignited substance like sulphur or sulphides, or phosphorus or phosphides, &c. Gunpowder made in different countries varies in composition, but for rifle, cannon, and sporting powders it usually contains 74 to 75 parts of saltpetre, 9 to 14 parts of sulphur, 12 to 16 parts of charcoal. For blasting powders less saltpetre and more charcoal is used.

**Propellant Explosives.**—The chief propellants are nitrocellulose, also called nitrocotton or gun-cotton, and nitroglycerine. **Nitrocellulose.**—The chief sources of cellulose are wood and cotton. When cotton is plentiful, nitrocellulose is made as follows. Cotton-waste is hand-picked to get rid of string, wood, &c.; it is opened out by a teasing-machine, and the cotton is then dried. The cotton is then nitrated with 'mixed acid'—a mixture of about 16 per cent nitric and 75 per cent sulphuric acid—at 15° to 25° C. After the nitration, the acid is removed and the nitrocotton boiled up in water to stabilize it. Wet nitrocotton is quite safe although it can be detonated, but dry nitrocotton is very dangerous. **Nitroglycerine.**—Mixed acid, containing 41 per cent nitric acid and 57.5 per cent sulphuric acid, is brought to 22° C. by cooling coils of brine, and pure glycerine is injected into the acid at such a rate that no glycerine accumulates unchanged, and that the temperature is kept between 15° and 22° C. When all the glycerine has been added, the liquid is allowed to stand, and the nitroglycerine rises to the surface. It is run off to the wash-house, where it is washed free from acid and settled. The process is a dangerous one, and great care must be taken at every stage of the manufacture. Nitroglycerine, when absorbed in a porous earth called 'Kieselguhr', is called dynamite. For *cordite*, the nitrocotton, freed from moisture, is mixed with nitroglycerine, and the paste is incorporated into a uniform dough with ether and alcohol. Some mineral jelly is added to render the explosive more stable. The dough is pressed through different sizes of dies according to the product desired. For rifle powder fine cords are used; for artillery, thicker cords or flat ribbons of varying thicknesses are required.

**High Explosives; Picric Acid.**—At the outbreak of the European War the chief high explosive of the Entente Powers was lyddite (in France, *mélinite*), also called trinitrophenol or picric acid. It is a bright-yellow solid, melting-point 122° C., sparingly soluble in water, and forms easily exploded metallic salts. It is now displaced by trinitrotoluene. Picric acid is made from phenol or carboic acid. Phenol is obtained from coal-tar, or made synthetically from benzene. Picric acid

has a high melting-point, it must be used pure, and is dissolved by water. It attacks metals, forming dangerous compounds, and requires troublesome plant for its manufacture. Hence it has been displaced by more suitable substances, notably by *trinitrotoluene* (T.N.T.). This is a very pale-yellow solid, melting-point  $80.2^{\circ}\text{C}$ ., and therefore melted by hot water, almost insoluble in water, burns quickly in the air, is inert, and comparatively safe to handle. *Tetryl* is a powerful high explosive, much more dangerous than T.N.T., and also more poisonous to handle.

*Detonating Substances*.—Though modern explosives are not easily exploded by a blow, they are sensitive to shock of given intensity, and lesser or different shocks will not suffice. The 'detonator' to produce the shock is set into the explosive. A complete shell carries two detonators. One, in the percussion cap, sets off the propellant charge which expels the projectile; the other, in the fuse in the nose of the shell, is ignited by the discharge of the gun, and detonates the high-explosive filling at a set interval after the discharge of the shell. Therefore, the shell can be exploded either in its flight or on its arrival at its objective. The manufacture of detonators is a very dangerous and delicate operation. Some substances (the copper acetylides) explode by a scratch, some (nitrogen iodide) by the touch of a feather or the tread of a fly, some explode even in solution when poured from one vessel into another. Mercury fulminate is more often employed in the detonator, and is prepared from mercury, alcohol, and nitric acid. It is expensive, and most modern detonators consist of lead azide or salts of styphnic acid, with a layer of T.N.T. in a narrow aluminium cylinder.

**Exponential Theorem.** If  $a^x = N$ ,  $x$  is said to be the logarithm of  $N$  to the base  $a$ . There are two bases of logarithms in common use, the base 10 and the Napierian base  $e$ . The exponential theorem states that the value of  $e^x$  is given by the infinite series  $1 + x + \frac{x^2}{1.2} + \frac{x^3}{1.2.3} + \dots + \frac{x^n}{1.2.3\dots n} + \&c$ . Putting  $x$  equal to 1,  $e = 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3} + \frac{1}{1.2.3.4} + \dots$ ;  $e$  is an incommensurable number

which to five decimal places is equal to 2.71828. See *Logarithm*.

**Exports.** See *Foreign Trade*.

**Extradition**, the act by which a person accused of a crime is given up by the Government in whose territories he has taken refuge to the Government of which he is a subject. The Extradition Act of 1870 makes special provision that no criminal shall be surrendered for a political offence, and that the criminal shall not be tried for any but the crime for which he was demanded. Other British Extradition Acts are those of 1873, 1895, and 1906.

**Extreme Unction**, one of the seven sacraments of the Roman Catholic Church. It is performed in cases of mortal disease by anointing, in the form of a cross, the eyes, ears, nose, mouth, hands, feet, and reins (in the case of males).

**Exuma, Great and Little**, two of the Bahama Islands. The former is 30 miles long and 3 miles wide, and has a good harbour. Pop. 3730.

**Eyck, Hubert (1366-1426)**, and **Jan van (1385-1440)**, brothers, painters of the old Flemish school. They executed the *Adoration of the Lamb* for the Cathedral of Ghent; a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. Jan's reputation became very great even during his lifetime, by his share in the introduction of oil-painting; the original invention of which has been incorrectly ascribed to him by many. Three portraits by Jan van Eyck, *The Scholar*, *The Man with a Turban*, and *Giovanni Arnolfini and his Wife*, are in the National Gallery, London; the *Madonna of the Chancellor Rollin* is in the Louvre.

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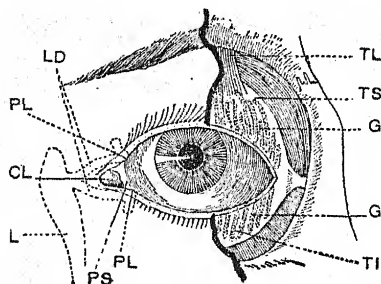


Fig. 1

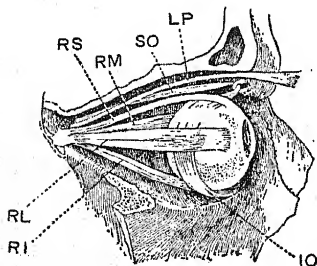


Fig. 2

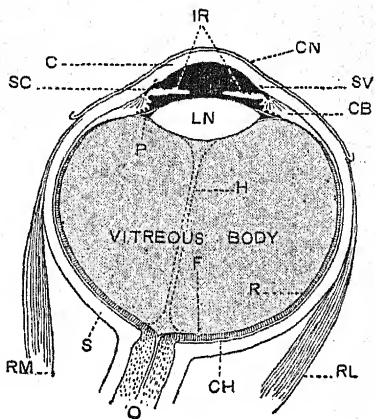


Fig. 3

#### Diagrammatic Views of the Human Eye

1. *Front of left eye:* PS, Plica semilunaris. L, Lachrymal sac. CL, Caruncula lachrymalis. PL, Punctum lachrymale. LD, Lachrymal ducts. TL, Tendon of levator. TS, Tarsus superior. G, Tarsal (Meibomian) glands dotted in. TI, Tarsus inferior.

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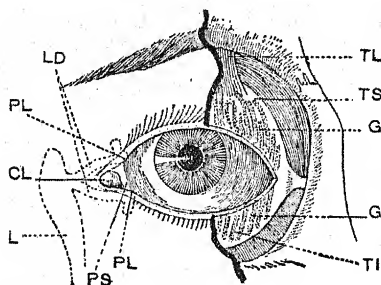


Fig. 1

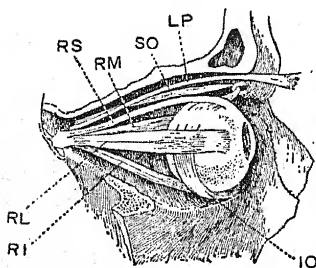


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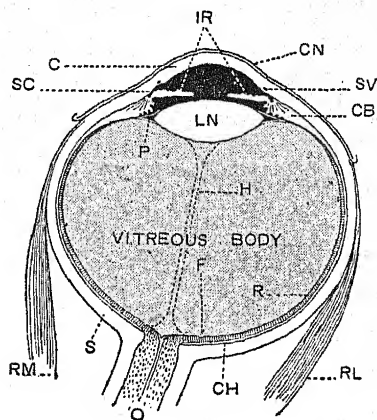


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that transmit the effects of such stimulation as a nervous current to the optic nerve which carries it to the brain. It is composed of minute cones and cylinders or *rods*, which are believed to be the agents by whose aid the waves of light become transformed into the stimulus of a sensation. The ocular globe is put in motion by six muscles. In these movements the centre of the globe is immovable. Each eye is furnished with two eyelids, fringed with short, fine hairs called eyelashes; and along the edge of the lids is a row of glands similar to the sebaceous glands of the skin. The lachrymal apparatus is composed of, firstly, the *lachrymal gland*, which lies in a depression of the orbital arch; secondly, the *lachrymal canals*, by which the tears are poured out upon the conjunctiva a little above the border of the upper lid; thirdly, the *lachrymal ducts*, which are destined to receive the tears after they have bathed the eye, and of which the orifices or *lachrymal points* are seen near the internal ends of the lids; fourthly, the *lachrymal sac*, in which the lachrymal ducts terminate, that empties the tears into the *nasal canal*. The tears, by running over the surface of the conjunctiva, render it supple and facilitate the movements of the globe and eyelids by lessening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

*Vision*.—The retina renders the eye sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to focus the luminous rays on the surface of the retina, a condition necessary for distinct vision and the clear perception of objects. The visual impressions are transmitted from the retina to the brain by means of the optic nerve. To accommodate the eye to different distances the lens is capable of altering itself with great precision and rapidity. When we look at a near object, the anterior surface of the lens bulges forward, becoming more convex the nearer the object; the more distant the object the more the lens is flattened. When the transparency of the cornea, the crystalline lens, or any of the contents of the globe of the eye is destroyed, either partially or entirely, then will partial or total blindness follow, since no image

can be formed upon the retina; but although all the media and the cornea be perfectly transparent, and retain then proper forms, which likewise is necessary to distinct vision, yet injury or inactivity of the optic nerve, or injury of the parts of the brain with which it is connected, may produce disturbance of vision or total blindness. Defective vision may also arise from the crystalline lens being so convex as to form an image before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the lens may be too flat, a defect which is corrected by convex lenses. In old age, and in fact in most people after about forty-five years of age, the elasticity of the lens becomes reduced, and convex lenses become necessary to make it possible to focus near objects. This condition is known as *presbyopia*.—BIBLIOGRAPHY: F. Fergus, *Elementary Ophthalmic Optics*; J. Herbert Parsons, *Diseases of the Eye*.

*Eyebright* (*Euphrasia officinalis*), a small plant belonging to the nat. ord. Scrophulariaceæ, common in Europe, North Asia, &c. It is an annual, half-parasitic on grass-roots, from 3 to 8 inches high, often much branched, with a bitter taste.

*Eyemouth*, a burgh and fishing-town of Berwickshire, Scotland, at the mouth of the Eye. There is accommodation for small vessels. Pop. (1931), 2231.

*Eyre*, Edward John (1815–1901), British explorer and colonial governor. He went to Australia in 1833, in 1839 discovered Lake Torrens, and afterwards reached King George's Sound, in Western Australia. He was appointed Governor of Jamaica in 1862. In 1865 he was confronted with a negro rebellion, which he crushed. On his return to England John Stuart Mill and other so-called humanitarians took measures to try him for murder, but failed. Tennyson and Carlyle were among his most strenuous defenders.

*Eyre*, Lake, a large salt-water lake of South Australia. The area is about 4000 sq. miles, but it is subject to great fluctuations in size.

*Ezekiel*, the third of the great prophets. He was carried away when young (about



599 B.C.) into the Babylonian captivity. The *Book of Ezekiel* contains predictions made before the fall of Jerusalem, 586 B.C.; prophecies against some of the neighbouring tribes; prophecies concerning the future of Israel; and a series of visions.

Ezra, a Jewish scribe and priest. Under his guidance the second expedition of the Jews set out from Babylon to Palestine in

the reign of Artaxerxes I, about 458 B.C. Ezra took some part, it is believed, in settling the canon of Scripture. The *Book of Ezra* contains an account of the favours bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him.

## F

F, the sixth letter of the English alphabet, is a labio-dental articulation, formed by the passage of breath between the lower lip and the upper front teeth. It is classed as a surd spirant, its corresponding sonant spirant being *v*.

Fabian Society, a Socialist organization, founded in 1888, whose object, as defined by the basis which members are required to sign, is the nationalization of all land and industrial capital for the benefit of the whole community; this result to be attained, not by any violent upheaval, but by educating the minds of the masses and gradually extending the control of the State over the factors of production. The growth of the labour movement has rather diminished the importance of the society, and has led to some secessions from its ranks.

Fabii, a family of Rome, who in the Veientine War were (according to the legend) drawn into an ambush and killed to a man. A boy who happened to be left in Rome became the second founder of the family. Among its celebrated members in aftertimes was Fabius Maximus, whose policy of defensive warfare was so successful against Hannibal in the Second Punic War (218–201 B.C.).

Fable, a narrative in which beings irrational and sometimes inanimate are, for the purpose of moral instruction, feigned to act and speak with human interests and passions. The oldest fables are supposed to be the Oriental; among these the Indian fables of Pīpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. Amongst the Greeks, Æsop is the master of a simple but very effective style of fable. The version of Æsop by Babrius (discovered in 1842) is the best extant. The fables of Phædrus are a Latin version of those

of Æsop. In modern times Gellert and Lessing among the Germans, Gay among the English, the Spanish Yriarte, the Italian Pignotti, and the Russian Ivan Krylov, are celebrated. The first place, however, amongst modern fabulists belongs to the French writer La Fontaine.

Fabre, Jean Henri (1823–1915), French entomologist. He was particularly noted for the remarkable patience with which he investigated the life-history of insects, and for his minute and painstaking observations. His works first appeared in the *Annales des sciences naturelles* from 1855 onwards, and were afterwards amplified in his *Souvenirs Entomologiques* in 10 volumes, published between 1878 and 1907.

Fabriano, an episcopal city of Italy, province of Ancona. The city is celebrated for paper-mills and gunpowder; glue and felt are also made. There is a trade in agricultural produce. Pop. 23,750.

Facciolati, Jacopo (1682–1769), Italian classical scholar. The most important work with which he was connected was the *Totius Latinitatis Lexicon*, compiled by Forcellini under his direction and with his co-operation.

Face, the front part of the head, the seat of most of the sense-organs. The bony basis of the face, exclusive of the thirty-two teeth, is composed of fourteen bones. The anterior part of the brain-case (frontal bone) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the base of the skull.

Facial Angle, an angle of which various definitions have been given by craniologists. In general terms, it may be defined as the angle between the axis of the face and the axis of the skull. In Camper's definition,

it is the angle between a line from ear to nostrils and another line from nostrils to forehead. As a general rule, applicable to races but not to individuals, the wider the facial angle, the more intellectual the type.

**Factory Acts**, Acts passed for the regulation of factories and similar establishments. Various Acts were passed up to 1878, when a general Factory and Workshop Act was passed, consolidating the previous series of statutes. Its scope was extended by a further series of enactments, until in the year 1901 the last general Act was passed, which consolidates and amends all previous legislation. The Act contains general provisions regarding drainage, sanitary conveniences, overcrowding, ventilation, fencing of dangerous machinery, &c. Factories are distinguished from workshops as making use of steam or other mechanical power. In textile factories the hours of labour for women and young persons (the latter between 14 and 18 years of age) are restricted to 10, but only  $6\frac{1}{2}$  on Saturday and 56 in the week. In non-textile factories and workshops the hours may be  $10\frac{1}{2}$  per day and 60 per week at most. Children (of 12 to 14 years) were not allowed to be employed more than  $6\frac{1}{2}$  hours on any one day. (The Education Acts now prohibit almost entirely the employment of 'school children' in factories and workshops.) Provision is made for a certain number of annual holidays. Special provisions for particular kinds of factories are made, and under these the employment of females and young persons is regulated in bleaching- and dyeing-works, lace-factories, manufactories of earthenware, lucifer matches, percussion caps, cartridges, blast-furnaces, copper-mills, forges, foundries, manufactories of machinery, metal, india-rubber, gutta-percha, paper, glass, tobacco, letterpress printing, book-binding, &c. The Act of 1901 included laundries carried on by way of trade or for the purposes of gain. An Act of 1907 extended the Act of 1901 to laundries carried on as ancillary to another business or incidentally to the purposes of any public institution. A short Act passed in 1911 gave power to make regulations applicable to cotton-cloth factories. Certain exceptions in regard to working overtime are provided for; thus women may sometimes work 14 hours a day.

**Faenza**, an episcopal city of North

Italy, in the province of Ravenna. The manufacture of the earthenware known as *faience* is important, and there is also a trade in silk. Pop. (commune), 40,164.

**Faeroe Islands**, a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark, and are twenty-one in number, seventeen being inhabited. Barley is the only cereal that comes to maturity; turnips and potatoes thrive well. There is no wood, but peat and coal are plentiful. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn, in Strömö, the largest island, is the seat of government. Sheep, feathers, fish, and fish-oil are exported. Pop. 21,352.

**Faguet**, Émile (1847-1916), French literary historian, critic, and journalist. Among his numerous works are: *Le théâtre contemporain*, *Drame ancien et drame moderne*, *Histoire de la littérature française*, *Propos littéraires*, *Initiation into Literature*, and *Initiation into Philosophy*.

**Fahlerz**, or grey copper ore, is of a steel-grey or iron-black colour. It occurs crystallized in the form of the tetrahedron. Specific gravity, 4.5-5.1. Tetrahedrite, the typical species, is composed of copper, sulphur, and antimony.

**Fahrenheit**, Gabriel Daniel (1686-1736), German physicist. In 1720 he effected a great improvement by the use of quicksilver instead of spirits of wine in thermometers. He invented the Fahrenheit scale (see *Thermometer*), and made several valuable discoveries in physics.

**Faience**. See *Pottery and Porcelain*.

**Failsworth**, a town of England, in Lancashire, 4 miles N.E. of Manchester, with cotton-mills. Silk-weaving and hat-making are also carried on. Pop. (1931), 15,724.

**Fainting**. See *Syncope*.

**Fairbairn**, Sir William (1789-1874), Scottish engineer. About 1831, his attention having been attracted to the use of iron as a material for shipbuilding, he built the first iron ship. He shares with Robert Stephenson the merit of constructing the great tubular bridge across the Menai Strait. He was one of the earliest members of the British Association for the Advancement of Science, of which he was president in 1861. His works include: *Iron: its History, Properties, and Manufacture* (1841); *Application of Iron to Building Purposes* (1854); *Iron Shipbuilding* (1865).

**Fairfax**, Edward (c. 1580-1635), the

translator into English verse of Tasso's *Jerusalem Delivered*. The first edition of his translation bears the date of 1600.

Fairfax, Thomas, Lord (1611-1671), Parliamentary general during the English Civil War. In 1642 he was appointed General of the Horse, and two years later held a chief command in the army sent to co-operate with the Scots. In 1645 Fairfax became General-in-Chief of the Parliamentary army, but retired into private life in 1650, after refusing to march against the Scots. He helped to bring about the restoration in 1660.

Fair Head, a basaltic promontory of Northern Ireland, County Antrim, rising to the height of 636 feet.

Fairies and Elves. The fairies of folk-belief must be distinguished from the fairies of imaginative literature. Shakespeare, for instance, drew upon the fairylore of living tradition to create a new fairy mythology (as in *A Midsummer-Night's Dream*) which became a literary convention. In the fairy stories of Hans Andersen the folk-material was similarly used in a free and individual manner. A distinction must likewise be drawn between the Celtic fairies and the Teutonic elves. The former are mainly females, like the nymphs of Homer, ruled over by a fairy queen, while the latter are mainly males, ruled over by an elf-king. The fairies were supposed to abduct human children, leaving 'changelings' in cradles, and to carry off wives to act as 'wet nurses' or midwives. Men who died suddenly were supposed to be transported to Fairyland. King Arthur, the Rev. Mr. Kirk of Aberfoyle, Thomas the Rhymer, and others were removed to the Fairy Paradise. Among the Celtic fairies were *pixies*, *geniti-glinni* (valley genii), *Bocanachs* (male goblins), *Bananachs* (female goblins), *Demna acir* (spirits of the air), &c. Fairies might appear in animal forms, chiefly as beautiful birds. Elves were workers in metals, like Wayland Smith, and guardians of treasure who assumed the forms of fish, otters, serpents, &c. Black elves dwelt under the ground, and white elves haunted the air and the sea. Sea-elves were called 'nikkers'. See *Folklore*.—BIBLIOGRAPHY: T. Keightley, *Fairy Mythology*; E. S. Hartland, *Science of Fairy Tales*.

Fair Isle, an island lying nearly midway between the Orkney and Shetland Islands,

3 miles long by 2 miles broad. Some grain is grown, but the surface is mostly in pasture. The men engage in fishing; the women knit a well-known variety of hosiery and of jerseys (*Fair Isle Jumper*). Pop. 147.

Fairweather, Mount, on the west coast of North America, in Alaska territory; height, 14,900 feet.

Faith-healing. Faith-healing traces its source to the raising of the apparently dead, the curing of the sick, the restoration of sight to the blind, and other recorded miracles of Christ; thence through the miracles of the disciples and their successors, down to the performances of Dorothy Trudel in Switzerland, and the displays of Dowie in London (1904). Faith, or some may say credulity, attributes the alleged cures to supernatural agency; science sees in them the action of 'suggestion', with an exalted and emotional state of mind in the patient, more especially when surrounded and encouraged by a crowd of expectant and credulous lookers-on. In a broad sense of the term the belief in healing by faith has been at the root of 'touching' for the King's Evil, a practice followed by several English and French sovereigns (see *Macbeth*, iv, 3, 141); of the value placed on relics; of alleged cures effected at such 'holy places' as St. Winifred's Well in Wales, the miraculous grotto at Lourdes, and, more recently, at the grotto at Carfin, Lanarkshire.

Faiyum, a province of Upper Egypt, well irrigated and fertile. It abounds in ancient remains. The capital is Medinet-el-Faiyum (q.v.). Area of province, 669 sq. miles; pop. (1927), 552,581.

Fakirs, a kind of fanatic, met with chiefly in India, who retire from the world and give themselves up to contemplation. They gain the veneration of the lower classes by absurd penances and self-mutilations.

Fal, a river of Cornwall, falling into the English Channel at Falmouth.

Falaba, a town of Sierra Leone, West Africa. It stands at the junction of many trade routes, and has a good trade in palm kernels, &c. Pop. 6000.

Falaise, a town, France, department of Calvados. It contains the ruined castle of the Dukes of Normandy. Pop. 6850.

Falcon, a maritime state of Venezuela, washed by the Gulf of Maracaibo and the

Caribbean Sea. The coastal regions are sterile, but the hills of the interior enclose several fertile valleys. The capital is Coro. Pop. (1926), 178,642.

**Falcon**, a name of various birds of prey, members of the family Falconidae. The largest European falcons are the jerfalcon or gyrfalcon (*Falco gyrfalco*), found in the Scandinavian Peninsula; the Iceland falcon (*F. islandus*); and the Greenland falcon (*F. candicans*). All of these are about 2 feet long. The Norwegian and

term falcon is by sportsmen restricted to the female, the male, which is smaller and less courageous, being called *tiercel*, *tersel*, *tercelet*, or *falconet*.

**Falcone**, Aniello (1600-1665), Italian painter. His paintings, consisting chiefly of battle-pieces, are masterpieces, but very rare.

**Falconer**, William (1732-1769), British poet. He went to sea in the merchant service, was wrecked, and wrote a poem (*The Shipwreck*) descriptive of the incidents, published in 1762. In 1769 he published a *Universal Marine Dictionary*, and in the same year was lost at sea.

**Falconry**, also called *hawking*, the pursuit of game by means of trained hawks or falcons. Falconry is a sport of great antiquity in Asia, having been followed in China as early as 2000 B.C. In Europe it was, during the Middle Ages, the favourite amusement of princes and nobles, and, as ladies could take part in it, became very general. In Britain the sport was practised before the Norman Conquest, but became still more popular after it, and till about 1650 enjoyed the prominence now held by fox-hunting. The game hunted included hares and rabbits, and, in the East, gazelles; with herons, wild geese, and many smaller birds. The training of a hawk is a work requiring great patience and skill. When a hawk suffers itself to be hooded and unhooded quietly, and will come to the trainer's hand to receive food, its education is considered far advanced, and the work of accustoming it to the *lure* may be proceeded with. The *lure* may be a piece of leather or wood, covered with the wings and feathers of a bird, and with a cord attached. The falcon is fed from it, and is recalled from flight by the falconer swinging the lure round his head with a peculiar cry. When fully trained and being used for sport, the falcon is kept hooded until actually required to fly.—Cf. H. Cox, C. Richardson, and G. Lascelles, *Coursing and Falconry* (The Badminton Library).

**Faliero**, Marino (1274-1355), Doge of Venice. He succeeded Andrea Dandolo, 11th Oct., 1354, was accused of the design of overthrowing the republic, and beheaded 17th April, 1355. Byron and Swinburne have written tragedies on the subject.

**Falkirk**, a burgh of Scotland, in Stirlingshire, 21½ miles west by north of Edinburgh. In the town or its vicinity



Greenland Falcon (*Falco candicans*)

the Iceland falcon are dark; the Greenland is white and is the most valuable. These three Arctic falcons are often referred to the special genus *Hierofalco*. The peregrine falcon (*F. peregrinus*), at one time a favourite in falconry, chiefly inhabits wild districts, and preys on grouse, partridges, ptarmigans, pigeons, rabbits, &c. It is said to fly at 150 miles per hour. Other British falcons are the hobby (*Hypotriorchis subbuteo*); the merlin or stone-falcon (*Esalon regulus*), small but swift and spirited; and the kestrel or wind-hover (*Tinnunculus alaudarius*), one of the most common British falcons. The



are the Carron Ironworks and other works, collieries, chemical-works, and distilleries. Falkirk is connected with the port of Grangemouth by a railway 3 miles long. The famous cattle fairs, or *trysts*, have been done away with. Pop. (1931), 36,565.

Falkland, a royal burgh of Scotland, county of Fife, 21 miles north of Edinburgh. It was once the residence of the Scottish kings. Pop. (1931), 791.

Falkland Islands, an island group belonging to Great Britain, in the South Atlantic Ocean. They consist of two larger islands, East Falkland and West Falkland, containing respectively about 2580 and 2038 sq. miles, with a great number of smaller ones surrounding them; total area, 4618 sq. miles. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for the sheep and cattle the rearing of which is the principal industry. Fish and sea-fowl abound. Wool, frozen meat, hides, and tallow are the chief exports; value in some years £600,000. The climate is equable and very healthy. The Falkland Islands were discovered by Davis in 1592. Along with South Georgia, South Shetlands, South Orkney, Graham's Land, and the Sandwich Islands they form a Crown colony. Port Stanley, in East Falkland, is a thriving settlement, and has now a wireless station. Pop. of the group, 2140.

Fallacy. See *Logic*.

Fallières, Clément Armand (1841–1931), eighth President of the French Republic. He became Minister of the Interior in 1882, Minister of Public Instruction from 1883 to 1885, and subsequently Minister of Justice and Public Instruction. He entered the Senate in 1890. In 1899 he became President of the Senate, and on 16th Jan., 1906, was elected President of the Republic. It was due to his initiative that a Ministry of Labour was formed in 1909. His term of office ended in Jan., 1913.

Fall of Bodies. All bodies on the earth, by virtue of the attraction of gravitation, tend to the centre of the earth. In the air bodies fall with unequal velocities, a piece of paper, for instance, more slowly than a ball of lead; and it was formerly thought that the velocity of the fall of bodies was in proportion to their weight. This error was attacked by Galileo, who, experimenting with balls of different sub-

stances which he dropped from the tower of Pisa, was led to the conclusion that the resistance of the air acting on different extents of surface was the cause of the unequal velocities, and that in a vacuum all bodies would fall with the same velocity. The truth of this last proposition was first demonstrated by Newton in his celebrated 'guinea-and-feather' experiment, where a guinea and feather are shown to fall side by side in the vacuum of the air-pump.

When a body falls from rest it acquires velocity at the rate of about 32·2 feet per second every second. This number, which represents the acceleration due to the force of gravity, and is usually denoted by *g*, varies slightly with the locality, increasing from the equator to the poles. The space fallen through in any given time is found by multiplying the square of the number of seconds by 16·1. See *Dynamics*; *Gravitation*.

Fall River, a port, Bristol County, Massachusetts, U.S.A., on Narraganset Bay, 53 miles s.s.w. of Boston, at the head of deep-water navigation. The depth alongside the quays is 20 feet. It has extensive cotton, woollen, and calico-printing factories, as well as iron-works. Pop. 120,485.

Falmouth, a seaport of England, in Cornwall. The outer harbour affords anchorage for vessels of the largest draught at all states of the tide. The tidal harbour is 23 feet deep at low water. There are shipbuilding and repairing yards and several dry-docks. Fishing, brewing, and rope-making are the chief industries. Pop. (1931), 13,492.

False Personation. To personate the owner of any share, stock, or annuity, &c., is felony, and renders the offender liable to penal servitude for life, or to a modified term of penal servitude or imprisonment. The personation of voters at an election is a misdemeanour punishable with imprisonment and hard labour, for a term not exceeding two years.

Falster, a Danish island in the Baltic, separated from Laaland by a narrow strait; flat, well watered, and wooded; productive in grain, pulse, potatoes, and, above all, fruit; area, 183 sq. miles. The principal town is Nykjøbing. Pop. 37,460.

Falun, a town of Sweden, on Lake Runn. It has a mining-school, museums, and mineralogical collections. Within the town boundary is the famous Falun

copper-mine, formerly the richest in Sweden, and worked for 500 years. Pop. 13,231.

**Famagusta**, a seaport on the east coast of Cyprus. It has advanced under the British, who have improved the harbour. The main exports are linseed and fruits. Pop. 6127.

**Fambina**, another name for Adamawa (q.v.).

**Famine**. The causes of famine are either natural, such as crop failures due to disease or to excessive or deficient rainfall; or political and economic, such as war, or defects in the organization of production and distribution. In Ireland the years 1814, 1816, 1822, 1831, and 1846 were marked by failure of the potato crop. India has been the seat of many great famines, which recur at more or less regular intervals. Amongst the more recent famines are that in North-West India (1837-1838), in which above 800,000 perished; that in Bengal and Orissa (1865-1866), when about a million perished; that in Bombay, Madras, Mysore (1877); that of 1896-1897; and that of 1900 in Bombay, Punjab, &c. In China a great famine took place in 1877-1878, in which over 9 millions are said to have perished; another took place in 1888-1889, owing to the overflow of the Yellow River.

**Fanning Island**, a coral island in the centre of Polynesia. It has belonged to Britain since 1888 and belongs to the Gilbert and Ellice Islands Colony. The stretch of the Canada-Australia cable which runs from Fanning Island to Vancouver, 3458 miles, is the longest in the world. Area, 15 sq. miles; pop. about 200.

**Fano**, a seaport of Italy, on the Adriatic, province of Pesaro e Urbino. Fishing is the chief occupation. Pop. 25,000.

**Fan-palm**. See *Talipot Palm*.

**Fans**, an African race of people inhabiting the region of the west coast about the Gabon River and the Ogoway. They are an energetic race, skilled in various arts, and are rapidly increasing in numbers (about 800,000).

**Fantees**, a people of West Africa inhabiting the coast district of the Gold Coast Colony, between the Ashantis and the sea.

**Farad**, the practical unit of capacity for electricity, in the electromagnetic system of units; the capacity of a conductor or condenser whose potential is

raised by one volt when given a charge of one coulomb. This unit is too large for most purposes, and capacities are usually expressed in microfarads (q.v.).

**Faraday**, Michael (1791-1867), one of the greatest of English chemists and physicists. Early in life he was apprenticed to a bookbinder in London, but occupied himself in his leisure hours with electrical and other scientific experiments. After acting for a time as assistant to Sir Humphry Davy at the Royal Institution, in 1829 he became lecturer at the Royal Military Academy at Woolwich. In 1833 he was appointed to the newly established chair of chemistry at the Royal Institution, where he made most of his great electrical discoveries. As an experimentalist Faraday was considered the very first of his time. As a popular lecturer he was equally distinguished, and used to draw crowds to the Friday evening lecture at the Royal Institution. Clerk Maxwell, in the preface to his classical treatise on *Electricity and Magnetism*, states that his main purpose has been to express the ideas of Faraday in mathematical form. Amongst Faraday's works are: *Researches in Electricity* (1831-1855), *Lectures on Non-metallic Elements* (1853), *Lectures on the Forces of Matter* (1860), *Lectures on the Chemical History of a Candle* (1861).—BIBLIOGRAPHY: J. Tyndall, *Faraday as a Discoverer*; S. P. Thompson, *Michael Faraday: his Life and Work*.

**Farallones**, a group of small islands in the Pacific, about 30 miles from the entrance to the Bay of San Francisco.

**Farcy**, a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. Farcy must be reported to the local authorities.

**Fareham**, a town of England, in Hampshire, on Portsmouth harbour. It has ship-yards, potteries, and brickworks, and a considerable trade. Pop. (1931), 11,575.

**Fargo**, a town of North Dakota, U.S.A., on the Red River of the North. There is a large trade in grain, and the main industries are flour-milling, iron-founding, and the making of leather goods. Pop. 21,961.

**Faridpur**, a district of India, in Eastern Bengal; area, 2576 sq. miles; pop. 2,121,000. Jute is grown and exported. The chief town is Faridpur, on the Marā Padmā. Pop. 13,000.

**Farini, Luigi Carlo** (1812–1866), Italian statesman and author. He became known as a nationalist and patriot in the political movements of 1841. After the Peace of Villafranca, he was chosen dictator of the duchies of Parma and Modena, and was mainly instrumental in inducing them to unite with the Piedmontese monarchy. His *History of the Papal States from 1814 to 1850* is well known. In 1862 he became President of the Ministry, but lost his reason in 1863.

**Farmers-general**, private contractors, to whom under the old French monarchy was let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco, and customs. These contractors made enormous profits on the farming of the public revenues. In 1790 the system was suppressed by the Constituent Assembly.

**Farne Islands**, a group of seventeen islets, England, off the coast of Northumberland. The islands were acquired by the National Trust in 1924, and have become a bird sanctuary. There are two lighthouses. Pop. 15. See *Darling, Grace*.

**Farnham**, a town of Surrey, England. The staple trade is in hops. Pop. 18,294.

**Farnol, Jeffrey** (1878– ), British novelist. His works include: *The Broad Highway*, *The Amateur Gentleman*, *Black Bartlemy's Treasure*, *Martin Conisby's Revenge*, *Sir John Dering*, *The Loring Mystery*, and *Epics of the Fancy*.

**Farnworth**, manufacturing and mining town of Lancashire, England, 3 miles from Bolton. It has spinning-mills, engineering-works, and several other manufactures. Pop. (urban district, 1931), 28,711.

**Faro**, a seaport of Portugal, province of Algarve, 62 miles south-east of Cape St. Vincent. The harbour admits vessels drawing up to 12½ feet. It has a good trade in fruit, cork, and wood. Pop. 12,925.

**Faro**, a promontory forming the north-east point of Sicily at the entrance to the Strait of Messina.

**Faroës**. See *Faeroe Islands*.

**Farquhar, George** (1677–1707), Irish playwright. He produced his first comedy, *Love and a Bottle*, in 1698. It is a lively and amusing comedy, and was well received. *The Constant Couple* (1699) was also successful, as was its sequel *Sir Harry Wildair*. His other best-known plays are *The Recruiting Officer* (1706), and his masterpiece *The Beau's Stratagem*

(1707), written when he knew that death was fast approaching him. Farquhar stands above his contemporaries by reason of his realism. He did not go to other dramatists for his characters, but went straight to life. His influence upon Fielding, and therefore upon the rise and development of the English novel, was great, as he introduced a return to real models, and eschewed artificiality.

**Farragut, David Glascoe** (1801–1870), admiral of the United States. In 1861 he was appointed to command the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in January of the following year. New Orleans surrendered to the combined attack of the land and naval forces on 28th April. In Aug., 1864, he attacked the Confederate fleet in the Bay of Mobile, and forced it to surrender.

**Farrar, Frederic William** (1831–1903), English divine. Among his principal works are: *Eric: or Little by Little* (1858), *St. Winifred's* (1862), *The Life of Christ* (1874), *Life of St. Paul* (1879), *The Early Days of Christianity* (1882), *Lives of the Fathers* (1889), and *Darkness and Dawn*.

**Farrukhabad**, a city in Agra division, United Provinces, India. Cloth-printing is the chief industry. The district has an area of 1744 sq. miles, is very fertile, and produces wheat, barley, millet, poppies, and tobacco. Pop. (of district), 900,022; (of town), 51,567.

**Fars**, a maritime province of Persia, on the Persian Gulf. It is mountainous, but has many well-cultivated districts. The most important products are grain, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woollen, silk, and cotton goods; and in these and other articles an active trade is carried on, chiefly with India. Pop. estimated at 750,000.

**Fascism**. The crisis succeeding the European War was in Italy much more severe than in other countries, partly because the nation lacked strong political organizations and constitutional traditions, and partly because there was no ruling middle class such as economic and political conditions had formed elsewhere. In 1919–1920 the severity of industrial unrest was such that a revolution seemed imminent, especially after the Communists had seized certain factories. The lower middle class, being economically impotent,

and being sandwiched between the rich upper class and the proletariat, resented the progress made by the workers and allied themselves to the capitalists. The result was the movement known as Fascism (Lat. *fascis* = the bundle of rods carried by the lictors in ancient Rome), the distinctive dress of which is the black shirt. To the world at large Fascism appeared as the force which had saved Italy from revolution. The leader was a lower middle-class school-master, Benito Mussolini, who had dominated the Socialist party from 1912 to 1914. In the autumn of 1920 the numbers of the Fascisti grew enormously, ex-soldiers, land-owners, men of Mussolini's own class, and industrial magnates joined the movement, which became so violently anti-proletarian, that it overstepped its original aim and ruined the organizations of the entire working class. At length in 1922 the Fascisti marched on Rome and captured many of the public buildings, and the king was forced to ask Mussolini to form a Government. This he did, and in succeeding years he strengthened Italy at home and abroad, and made Fascism almost a national creed. The main tenet of Fascism is that, though the individual has the right to develop his own personality, he exists for the community, and not the community for him. Fascism seeks justice for all classes of society, not by means of class war, but by the action of the State. *The British Fascisti* movement is royalist and anti-communist.

**Fashoda.** See *Kodok*.

**Fat**, an oily concrete substance, a compound of carbon, hydrogen, and oxygen, deposited in the cells of the adipose or cellular membrane of animal bodies. Fat is of various degrees of consistence, as in tallow, lard, and oil. It consists of esters of glycerine with fatty and other acids, these esters being generally termed glycerides. The commonest of these are stearin, a waxy solid, palmitin, a softer solid, and olein, an oil. Fats are insoluble in water. The consistency of any natural fat depends on the proportions in which these three substances are present. In the body fat is useful in retaining warmth, but its chief function is that of nutrition.

**Fatehgarh**, a town, United Provinces of India, on the Ganges, now municipally united with Farrukhabad. Pop. 12,500.

**Fatehpur**, a town of India, in district

of the same name, United Provinces, 50 miles south-east of Cawnpore. Pop. 16,939.—The district has an area of 1639 sq. miles, and a pop. of 686,400.

**Fates**, in Greek and Latin mythology, the three inexorable sisters who spin the thread of human life. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with shears, with which she cuts the thread off.

**Fathers of the Church, The.** As employed nowadays, this term has a great fluidity of meaning. In the widest sense it signifies all ecclesiastical writers (i.e. all writers within the Christian Church who treat of matters of Christian belief and practice) belonging to the older post-Apostolic period. In the narrower and more frequent sense it signifies only those ecclesiastical writers of the older post-Apostolic period who conform, more or less, to the Catholic tradition. While it is universally agreed that the Apostolic Age is succeeded by the Age of the Fathers, there is a difference of view as to when the Age of the Fathers terminates. Gregory I (the Great) is usually regarded as the last of the Latin or Western Fathers and the first of the Schoolmen, and John of Damascus as the last of the Greek or Eastern Fathers. But where the term 'Fathers' is broadly used to designate the older Church writers in general, the tendency is—and it is logically defensible—to extend the Patristic period far beyond the Age of the Great Fathers (325–451), and to include among the later Fathers many mediæval writers. The Fathers may be classified in accordance with the following scheme: (1) the *Apostolic Fathers* (the best known of whom are Clement of Rome, Ignatius, and Polycarp), who received their title not only as being younger contemporaries and perhaps personal disciples of Apostles, but also for their nearness and faithfulness to the Apostolic tradition; (2) the *Greek Apologists* (the most notable of whom is Justin Martyr), who sought to defend Christian truth on rational and philosophical grounds against both Jew and pagan; (3) the *Alexandrines* (outstanding among whom are Clement and Origen), who greatly furthered the development of Christian theology in general, but whose names are specially associated with the allegorical and mystical type of Scriptural interpretation; (4) the *North*



*African School* (to which Tertullian and Cyprian belong), who shaped Christian Latinity, as well as the theology and ecclesiastical polity of the West; (5) the *Cappadocians* (in which group the most prominent members are Basil, Gregory of Nazianzus, and Gregory of Nyssa), who caught up the theology of Athanasius, providing it with well-defined terms, and so laying broad the foundations of the Greek orthodoxy; (6) the *Antiochians* (among whom Chrysostom, Theodore of Mopsuestia, and Theodoret are the greatest), who were opposed to the Alexandrian mysticism and held by the literal and historical mode of Scriptural interpretation; (7) the *Western Nicene Group* (counting in their number eminent teachers like Hilary of Poitiers and Ambrose), who followed the Alexandrians in their exegetical method, and in their dogmatic theology Athanasius and the Cappadocians; (8) the *School of Augustine*, in which the Western theological tradition set by Tertullian and Cyprian culminated; (9) the *School of Lérins* (leading members of which are Hilary of Arles and Vincentius), which attempted to mitigate the extreme Augustinian doctrines of sin and grace.—BIBLIOGRAPHY: F. W. Farrar, *Lives of the Fathers*; E. Leigh-Bennett, *Handbook of the Early Christian Fathers*; H. B. Swete, *Patristic Study*.

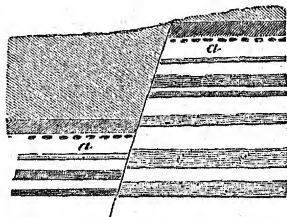
**Fatty Acids**, the homologues of formic and acetic acid; so called because the members first studied were obtained from fats and oils, e.g. butyric acid from butter, stearic acid from stearin, palmitic acid from palm-oil. These acids are obtained from fats (see *Fat*) by saponification with superheated steam or mineral acids.

**Fatty Degeneration**, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by fatty granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles, the heart, arteries, kidneys, &c.

**Faucit**, Helena, Lady Martin (1816–1898), English actress. She was one of the most important members of Macready's company during the Shakespearean revivals of 1837, and created the heroine's part in Lord Lytton's *Lady of Lyons*, *Money*, and *Richelieu*, and in Browning's *Stratford*, *Blot in the 'Scutcheon*, and *Colombe's Birthday*. Lady Martin wrote

a volume *On Some of Shakespeare's Female Characters*.

**Fault**, in geology, a fracture of strata, accompanied by a sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently recognizable in coal-beds. The cut shows at *a a* the change of position in strata caused



Fault in Geology

by a fault. This is called the *throw*, and is measured vertically. See Plate, *Geology*.

**Faun**, one of a kind of rural deities or demi-gods believed in among the Romans, inhabiting the forests and groves, and differing little from satyrs. Their form was principally human, but with a short goat's tail, pointed ears, and projecting horns; sometimes also with cloven feet.

**Faust**, or **Faustus**, Doctor John, a dealer in the black art, who lived in Germany early in the sixteenth century. There is really a substratum of fact beneath the Faust legend. Faust, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he travelled about, enjoying life in all its forms, but the evil spirit finally carried him off. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet-shows of Germany, and the legend forms the basis of Goethe's well-known drama *Faust*, and furnishes the libretto for Gounod's famous opera of the same name. As early as 1590 Christopher Marlowe made the legend the subject of his masterpiece *Doctor Faustus*.—Cf. H. B. Cotterill, *The Faust-legend and Goethe's Faust*.

**Faversham**, a borough of England, county Kent, on a branch of the Swale. It has manufactures of brick, cement,

and gunpowder. Faversham Creek is navigable up to the town for vessels of 200 tons. Pop. (1931), 10,091.

Favre, Jules (1809-1880), French politician. He was a leader of the party of opposition to the President Louis Napoleon; and after the *coup d'état* (1851) he retired from political life for six years. On the fall of the Empire he became Vice-President of the Government of National Defence and Minister of Foreign Affairs. As such he conducted the negotiations for peace with Prince Bismarck, and signed the Treaty of Paris at Frankfurt on 10th May, 1871. He resigned his office in July, 1871.

Favus is a skin disease which usually attacks the hair, and is often spread by cats and mice. It produces rounded cup-shaped crusts, and responds most satisfactorily to X-ray treatment.

Fawcett, Henry (1833-1884), English politician and economist. In 1858 he met with an accident which inflicted on him total blindness. In 1863 he was elected to the chair of political economy at Cambridge. He became Postmaster-General in the second Gladstone administration. Amongst his principal writings are: *A Manual of Political Economy*, *Lectures on the Economic Position of the British Labourer*, and articles on Indian finances.

Fawcett, Millicent Garrett (1847-1929), wife of the preceding. She was a prominent advocate of all measures for the educational and political advancement of women, and wrote *Women's Suffrage* (1912).

Fayal, an island belonging to Portugal, one of the Azores. It is 10 miles in diameter, and has a good climate. The soil is very fertile, producing wheat, maize, flax, and almost all the fruits of Europe. The chief place is Villa Horta or Orta. Pop. 22,385.

Feather-grass, the popular name of *Stipa pennata*, a native of dry places in the south of Europe. *S. tenacissima* is the esparto-grass used in paper-making.

Feathers. See *Ornithology*.

Feather-star, one of the stalkless echinoderms belonging to the Crinoidea, of which the best-known British type is the rosy feather-star.

Featherstone, an urban district in the West Riding of Yorks, England. The inhabitants work chiefly in the collieries. Pop. (1931), 14,952.

Febronianism, a system of doctrines antagonistic to the admitted claims of the Pope, and asserting the independence of national Churches. The term is derived from Justinus Febronius, a *nom de plume* assumed by John Nicholas von Hontheim, Archbishop of Trèves, in an important book on the subject, published in 1763.

Fécamp, a seaport of France, department of Seine-Inférieure, 23 miles north-east of Havre. It is one of the best ports in the Channel, and has many vessels employed in the cod, herring, and mackerel fisheries. There are two docks and a tidal harbour, suitable for vessels of 4000 tons. Pop. 17,388.

Fechter, Charles Albert (1824-1879), French actor. In 1860 he came to London, and at once achieved great success as Ruy Blas and Hamlet at the Princess's Theatre. He subsequently leased the Lyceum, and afterwards the Adelphi, acting youthful and melodramatic parts with striking power.

Federated Malay States. See *Malaya*.

Federation of British Industries, an organization of British manufacturers established in 1916. The main objects of the Federation are to carry into effect a definite line of policy with regard to British industries, and to develop overseas and particularly Empire trade.

Fee, or Fief, is an hereditary estate in land. At law the King is the supreme owner of every parcel of land in the kingdom, and all land was originally held of some lord in return for military or other services, and mediately or immediately of the King. The term *fee* came to be equivalent to an estate of inheritance, that is, an interest in land which passes to heirs if the owners die intestate. *Fee simple* is a perpetual interest in land, and is to-day practically absolute ownership.

Fehmarn, an island in the Baltic Sea, belonging to Germany. It has an area of 70 sq. miles, and lies between Laaland and Holstein. Agriculture, fishing, and the manufacture of hosiery are the chief industries. Pop. 10,000.

Feisal, Emir (1887- ), King of Iraq (Mesopotamia), the third surviving son of Husein, King of Hejaz till 1924. During the European War Husein sided with the Allies, and Feisal organized and commanded a regular Arab army, which formed Lord Allenby's right wing. He was proclaimed King of Syria in 1920, but was

forcibly deposed by the French. In Aug., 1921, Feisal became the first Arab king of the new state of 'Iraq, set up by the British Government.

**Felaniche**, a town in the Island of Majorca. Pop. (commune), 11,400.

**Felegyhaza**, a town of Hungary, 66 miles south-east of Budapest, with large cattle-markets and an extensive trade in corn, wine, and fruit. Pop. 34,924.

**Felicudi**, one of the Lipari Isles, off the north coast of Sicily. It is about 9 miles in circuit. The soil is both fertile and well cultivated. Pop. 800.

**Felidae**, animals of the cat kind, a family of Carnivora in which the predaceous instincts reach their highest development. They are among the quadrupeds what the Falconidae are among the birds. The teeth and claws are their principal weapons. They all approach their prey stealthily, seize it with a spring, and devour it fresh. The species are not found in Australia. The family comprehends the lion, tiger, leopard, lynx, jaguar, panther, cheetah, ounce, serval, ocelot, and cat.

**Felix**, Marcus Minucius (c. A.D. 230), Roman lawyer, who embraced Christianity, and wrote a defence of it in a dialogue entitled *Octavius*.

**Felixstowe**, a watering-place in England, on the Suffolk coast. Pop. (1931), 12,037.

**Fellatah, Fulbe, or Fulahs**, an African race of the negro type, now widely diffused throughout the Sudan, where they are the predominant people in the states of Futa-Toro, Futa-Jalen, Bondu, and Sokoto. Though of the negro family, they have neither the deep jet colour, the crisped hair, flat nose, nor thick lips of the negro.

**Felling**, a populous locality in Durham, adjoining Gateshead. It contains chemical, shipbuilding, and other industrial works. Pop. (1931), 27,041.

**Fellows**, Sir Charles (1799-1860), British archaeologist. He first explored the valley of the Xanthus in Lycia, in 1838, and discovered the remains of the cities Xanthus and Teos. His principal works are: *The Xanthian Marbles: their Acquisition and Transmission to England, Travels and Researches in Asia Minor, and Coins of Ancient Lycia before the Reign of Alexander*.

**Fellowships** in the English colleges commonly range in value from about £150

to £250 a year, and they confer upon their holders the right to apartments in the college, and certain privileges as to commons or meals. Formerly they were tenable for life, or till marriage; but six or seven years is now a common period during which they may be held.

**Felo de se**, in law, a person who, with the same full malice aforethought as would render his killing of someone else murder, deliberately causes his own death. Before 1870 the goods of suicides were confiscated by the Crown, but by an Act passed in that year the confiscation of the goods of suicides was put an end to in the general abolition of forfeiture for felony, and in 1882 every penalty except the ecclesiastical one was removed.

**Felsite**, or **Felstone**, a hard, compact igneous rock of somewhat flinty appearance, composed usually of quartz and orthoclase felspar intimately mixed, but sometimes of less highly siliceous minerals.

**Felspar**, or **Feldspar**, a very important group of mineral silicates of aluminium, with potassium, sodium, or calcium, ranging from albite, the sodium felspar, with 68.8 per cent of silica, and orthoclase, the potassium species, with 64.7 per cent, to anorthite, the calcium species, with only 43.3. The felspars form an admirable example of the relation of chemical composition, specific gravity, and crystalline and optical features. At the same time, although orthoclase and microcline are both potassium felspars, yet the former crystallizes in the monoclinic, and the latter in the triclinic system. The forms throughout the felspar series are closely similar, and the hardness is uniform, being just below that of quartz, and about that of a steel file. Felspar is one of the principal constituents of almost all igneous rocks, such as granite, diorite, and basalt. The alkali species yield kaolin by alteration, and are thus the source of china-clay.

**Felt**, a kind of cloth made of wool, or of wool and cotton united by rolling, beating, and pressure. The use of felt as a material for hats, tents, or cloaks is very ancient. For hat-making the fur of rabbits, beavers, raccoons, and the wool of sheep is generally used.

**Feltre**, a town in Northern Italy, about 44 miles N.W. of Venice. There is a trade in wine, oil, and silk. Pop. 15,390.

**Femern**, an island of Prussia, province of Schleswig-Holstein. The inhabitants are

chiefly agriculturists and fishers, Pop. 9800.

**Femgerichte, Fehmgerichte, or Vehmgerichte**, criminal courts of Germany in the Middle Ages, which took the place of the regular administration of justice (then fallen into decay), especially in criminal cases. These courts originated and had their chief jurisdiction in Westphalia, and their proceedings were conducted with the most profound secrecy. In process of time, however, they degenerated, and no longer confined themselves to law and precedent, so that the secrecy in which they enveloped themselves only served as a cloak to their criminal purposes. The flagrant abuse of their power brought about their fall. In 1461 various princes and cities of Germany, as well as the Swiss confederates, united in a league against them, but their influence was not entirely destroyed until an amended form of trial and penal judicature was introduced. The last Femgericht was held at Zell in 1568.

**Fen**, a marsh or stretch of wet boggy land often containing extensive pools. The *Fens*, or the *Fen District*, is a marshy district of England, extending into the counties of Cambridge, Lincoln, Huntingdon, Northampton, Norfolk, and Suffolk. Much of the land has been reclaimed at vast expense, and is very fertile. See *Bedford Level*.

**Fencing**, the art of attack and defence with sword or rapier, no shield being used. It was in Italy in the sixteenth century that the skilful use of the small sword first became common. The art spread to Spain and then to France, where, on account of the prevalence of duelling, it was brought to a high degree of development. The small sword or rapier (which was adopted for duelling) has a point but no edge, and therefore demands the highest degree of adroitness in its use. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel and has a button at the end in place of a point. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knees should therefore be somewhat bent when the fencer is on guard, that

he may be light and elastic in his movements. Fencing with the broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drill-masters there are seven cuts, with corresponding guards, and three thrusts.

**Fénelon**, François de Salignac de la Mothe (1651-1715), French writer. In 1689 Louis XIV entrusted to him the education of his grandsons. In 1694 he was created Archbishop of Cambrai. A theological dispute (see *Quietism*) with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII, and his banishment to his diocese by Louis XIV. He left numerous works in philosophy, theology, and belles-lettres. The most celebrated is *Les Aventures de Télémaque*, in which he endeavoured to exhibit a model for the education of a prince.—**BIBLIOGRAPHY:** E. K. Sanders, *Fénelon: his Friends and his Enemies*; P. Janet, *Fénelon: his Life and Works*.

**Feng-hwang-cheng**, a town in Manchuria, China, in the province of Fengtien. It is open to international trade, and has a population of 25,000.

**Fengtien**, a dependency of China, one of three provinces of Manchuria. It lies between Chihli and Korea, and includes the Laiu-tung Peninsula with Port Arthur at its extremity. The capital is Mukden. Area, 56,000 sq. miles; pop. 5,830,000.

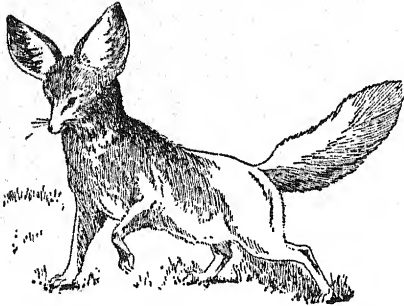
**Fenians**, the name assumed by those Irish conspirators who formed a brotherhood with the intention of establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was regularly organized in America, while at the same time large numbers joined the cause in Ireland, where James Stephens was 'head-centre'. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British Government, the first in Sept., 1865, the second in Feb., 1866. An invasion of Canada, attempted in the same year, failed as miserably as the attempt in Ireland. At last, on 5th March, 1867, the long-prepared insurrection broke out almost simultaneously in the districts of Dublin, Drogheda, and Kerry. The number of insurgents in the field, however, did not exceed 3000, and though they



burned some police stations, they nowhere faced the troops sent after them. In 1870 and 1871 two raids were again made on Canada, but both were signal failures.— Cf. J. Rutherford, *Secret History of the Fenian Conspiracy*.

**Fenn**, George Manville (1831–1909), British novelist. His novels include: *Bent, not Broken*; *The Man with a Shadow*; and *The Mynns Mystery*. His boys' books include: *Nat the Naturalist*, *Menhardoc*, and *The Crystal Hunters*.

**Fennec** (*Canis zerda*), a small animal allied to the dog and fox, and sometimes



Fennec (*Canis zerda*)

called the Sahara fox. It is remarkable for the great size of its ears.

**Fennel**, a fragrant plant, *Foeniculum officinale*, cultivated in gardens, belonging to the nat. ord. Umbelliferae. — *Giant fennel* is a popular name for *Ferula communis*, which attains sometimes a height of 15 feet.

**Fenton**, a town of England, Staffordshire. The industries include china and earthenware, brick-making, coal-mining, and iron-founding. It is within the boundaries of Stoke-on-Trent.

**Fer-de-lance**, the lance-headed viper or *Craspedocephalus* (*Bothrops*) *lanceolatus*, common in Brazil and the West Indian Islands. It is 5 to 7 feet in length. Its bite is almost certainly fatal.

**Ferdinand** (1861– ), ex-Tsar of Bulgaria, the son of the Prince of Saxe-Coburg-Gotha and the Princess of Orléans. He was chosen Prince of Bulgaria in July, 1887, but in 1908 assumed the title of Tsar of the Bulgars. In Oct., 1915, he joined the Central Powers. After the

final defeat of Germany he abdicated the throne on 4th Oct., 1918.

**Ferdinand**, German emperors: — (1) **Ferdinand I** (1503–1564), brother of Charles V. On the abdication of Charles he succeeded to the imperial title.—(2) **Ferdinand II** (1578–1637) succeeded his uncle Matthias as Emperor of Germany in 1619. His persecution of Protestants led to the revolt of the Bohemians, who offered the Bohemian crown to the Elector Palatine, a step which led in 1619 to the outbreak of the Thirty Years' War.—(3) **Ferdinand III** (1608–1657), son of the preceding, succeeded his father in 1637. The chief event of his reign was the Peace of Westphalia, concluded in 1648.

**Ferdinand V** (1453–1516), King of Aragon. In 1469 he married Isabella of Castile, and thus brought about that close connexion between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to pre-eminence amongst European states. After a war of ten years, they conquered Granada from the Moors (1491); but the most brilliant event of their reign was the discovery of America.

**Ferdinand I**, of Bourbon (1751–1825), King of the Two Sicilies (previously Ferdinand IV of Naples). He was the third son of Charles III, King of Spain, whom he succeeded, in 1759, on the throne of Naples, on the accession of the latter to that of Spain. In 1799 the French took possession of the whole kingdom, and proclaimed the Parthenopean Republic. The new republic did not last long. Ferdinand returned to Naples in 1800. Six years later he was again driven from Naples by the French. In 1816 he assumed the title of Ferdinand I, King of the Two Sicilies.

**Ferdinand II** (1810–1859), King of the Two Sicilies. He succeeded his father, Francis I, in 1830. His absolutism resulted in a series of popular outbreaks, culminating in the year 1848, when he earned the nickname of King Bomba by bombarding his capital from the forts. He was succeeded by his son, Francis II, who lost his crown when Italy was united in 1860 under Victor Emmanuel.

**Ferdinand VII** (1784–1833), King of Spain. He ascended the throne in March, 1808, but abdicated in favour of Joseph Bonaparte a month later. Ferdinand returned to Spain in March, 1814. His

arbitrary conduct caused an insurrection in 1820, after which his authority was once more made absolute in Spain. He left his crown to his daughter Isabella to the exclusion of his brother, Don Carlos.

**Ferentino**, a town in Central Italy, with a trade in oil and wine. Pop. 12,390.

**Ferghana**, a province of Turkistan. It consists mainly of a valley surrounded by high ranges of mountains and traversed by the Sir Darya and its tributaries. Area, 55,483 sq. miles; pop. about 2,169,600. Khoqand is the capital.

**Ferguson**, Adam (1724-1816), Scottish historical and political writer. In 1759 he was made professor of natural philosophy at Edinburgh, and in 1764 of moral philosophy. Among his chief works are: an *Essay on Civil Society* (1767), *Institutes of Moral Philosophy* (1769), *History of the Roman Republic* (1783), and *Moral and Political Science* (1792).

**Ferguson**, James (1710-1776), Scottish mechanician and astronomer. His principal works are: *Astronomy Explained upon Sir Isaac Newton's Principles* (1756); *Lectures on Mechanics, Hydrostatics, &c.* (1760); and *Select Mechanical Exercises* (1773).

**Fergusson**, James (1808-1886), Scottish writer on architecture. His principal work is his *History of Architecture in All Countries* (3 vols., 1865-1867), completed by a *History of Indian and Eastern Architecture* (1876). He also wrote *Notes on the Site of the Holy Sepulchre at Jerusalem*, *Tree and Serpent Worship*, and *Rude Stone Monuments in All Countries*.

**Fergusson**, Robert (1750-1774), Scottish poet. His poems in the Scottish dialect are of great merit. He was a victim both of drink and of religious mania. He was buried in the Canongate Churchyard, Edinburgh, where Burns erected a monument to the memory of this kindred genius, to whom he owed suggestions for several of his own poems.

**Ferishta**, more properly Mohammed Qasim (c. 1550-c. 1612), Persian historian. He wrote a *History of the Mohammedan Power in India*, which is the best yet written on the period which it embraces.

**Fermanagh**, an inland county of Northern Ireland; area, 457,369 acres. The county is divided by Lough Erne, and is mountainous towards its western boundary. The soil is variable, and not remarkably fertile. The manufactures are

unimportant. The county town is Enniskillen. Pop. (1926) 57,985.

**Fermentation** is a general term applied to changes in organic compounds by the action of bodies called ferments. The term was used at first to describe any chemical change accompanied by effervescence. About 1860 it was proved by Pasteur that many characteristic changes of organic matter, such as alcoholic fermentation, are due to the action of micro-organisms. Other changes, some of them of the highest importance in physiology, were afterwards found to depend on the presence of certain non-living substances, to which the name of *enzymes* has been given. Ferments are therefore divided into two classes, (a) organized ferments, and (b) unorganized ferments, or enzymes. The organized ferments are: (1) mould growth, (2) yeast plants, and (3) bacteria. The *moulds* are plants devoid of chlorophyll, which grow upon damp organic matter where ventilation is faulty, and are injurious in fermenting processes. The *bacteria* (q.v.), splitting ferments, or Schizomycetes, cause oxidation and decomposition. Steam at 100° C., or superheated steam, kills them instantaneously. The following varieties of bacteria are of great use industrially: *acetic acid bacteria* cause the oxidation of alcohol; *lactic acid bacteria* split up sugar into lactic acid; *butyric acid bacteria* ferment sugar and other carbohydrates and lactic acid into butyric acid; *proteolytic bacteria* are used in the tannery in the 'bating' or 'puering' process; *nitrogen-fixing bacteria* are of great value in agriculture. Other bacteria are used technically in the dairy, in the preparation of indigo, tobacco, tea, &c., and especially in the modern method of sewage disposal. Sulphur bacteria absorb sulphuretted hydrogen and other sulphur compounds, producing sulphates and even sulphuric acid.

The *yeasts* (Saccharomycetes) are single-cell Fungi, and are of great technical importance. Yeast consists of an aggregation of plant cells, forming a slimy yellow mass of peculiar odour and with an acid reaction. The most favourable temperature for propagation is 6° to 25° C., and the substances necessary for a growing plant must be present, i.e. a fermentable sugar, nitrogenous matter, phosphates and sulphates of calcium, potassium, and magnesium. When heated in water at

75° C., yeast is killed, but when dry, it can live from -130° C. to +100° C. Aleoholic fermentation occurs between 0° and 50° C., the optimum temperature being 28° to 34° C. Yeasts retain vitality longest in a 10 per cent solution of sucrose.

Yeasts may be divided into culture and wild yeasts, and culture yeasts include: (a) *Saccharomyces cerevisiae*, the ferment in beer, both top and bottom yeasts; and (b) *Saccharomyces ellipsoideus*, the wine ferment. Brewery yeast must generate the characteristic aromatic taste and odour, and must separate from the fluid. A distillery yeast must have a high fermenting power to produce the maximum amount of alcohol. A bakery yeast should be rapid in action, and generate much alcohol and carbon dioxide to raise the dough. English brewers use high or top fermentation yeast, working between 28° and 34° C. Porter, stout, ale, Weissbiere, Braumbiere, &c., are also made by that method. For lager beers low or bottom fermentation yeasts are used, working at 4° to 10° C. As for wine yeasts, each different wine district produces distinct and characteristic *ellipsoideus* races, and hence experts can distinguish wines from different districts by the various tastes and bouquets. See *Wines and Spirits*.

*The Enzymes or Unorganized Ferments.*—The enzymes are complex nitrogenous substances of high molecular weight, similar in elementary composition to albumen, and soluble in cold water, from which they are easily precipitated by alcohol. Their activity falls with rise in temperature, and at 80° C. most enzymes are destroyed. Their aqueous solutions rapidly putrefy. Antiseptics and strong mineral poisons, such as formaldehyde, phenol, strong mineral acids or bases, lead, copper, mercury, and zinc salts, destroy them. Enzymes attack complex molecules, splitting or 'hydrolyzing' them into simpler substances, usually with the addition of water. Hence starch, fats, and albumen become soluble. The action of the enzyme is often reversible. It is by the aid of enzymes that food-stuffs are rendered soluble and are digested. In all these transformations the enzyme itself remains unchanged, the part it plays being that of a *catalyst*, or substance a small quantity of which can bring about a

considerable chemical change without being altered itself.

Since each enzyme is characterized by its capacity of performing one specific action, they are classified according to the action they perform. *Diastatic enzymes* convert insoluble carbohydrates like starch and cellulose into soluble sugars. *Diastase* occurs in malt, *ptyalin* in saliva. *Inverting enzymes* transform disaccharides into simpler sugars, usually hexoses. *Sucrase* hydrolyzes cane-sugar; *maltase* converts maltose into two molecules of glucose; *lactase* converts milk-sugar into *d*-glucose and *d*-galactose. *Proteolytic enzymes* decompose various proteins into simpler bodies, even into the simple amino-acids. *Pepsin* decomposes albuminous bodies into peptones, *trypsin* decomposes albuminous substances into leucin, tyrosin, and other amino-acids, and *papain* acts on flesh. *Clotting enzymes* coagulate milk, precipitating the casein and leaving the milk-sugar in solution. *Thrombase* coagulates blood, and *pectase* produces vegetable jellies. The *lipases* split fats into glycerine and fatty acids. The *oxidases* oxidize various substances, e.g. *laccase*, *tyrosinase*. Cf. F. Lafar, *Technical Mycology*.

**Fermo**, a town of Middle Italy, province of Ascoli Piceno, on a height about 4 miles from the Adriatic, on which is its port, Porto di Fermo. There is a trade in grain, wool, and silk. Pop. (commune), 22,570.

**Fermoy**, a town, County Cork, Irish Free State, on the Blackwater. It has flour-mills and a considerable trade in corn. Pop. (1926) 4505.

**Fernando Noronha**, a small island in the Atlantic, forming one of a small group of the same name about 210 miles north-east of the coast of Brazil, to which it belongs, and by which it is used as a penal settlement. The population is about 2000, 1400 of whom are criminals.

**Fernando Po**, a Spanish island in the Bight of Biafra, off the west coast of Africa, about 20 miles from the mainland. It has an area of 780 sq. miles, and is traversed from north to south by a ridge of mountains terminating in a magnificent cone, 9185 feet high, called Clarence Peak. The island is picturesquely covered with forests and luxuriant vegetation, chiefly palms and the bombax or silk-cotton tree. There are several harbours in the island, but there are no docks. The population

is 14,004, including 300 Europeans. The aborigines are called Bubis. The capital is Santa Isabel.

Fernie, a town of British Columbia, Canada, on Elk River. It is a coal-mining centre (annual output, 1,000,000 tons), and has 500 coke-ovens. It is served by the C.P.R. Pop. of district, 7000.

Ferns (Filices or Filicales), a natural order of cryptogamous or flowerless plants, forming the largest group of the Pteridophyta. The familiar fern-plant is the *sporophyte* (see *Generations, Alternation of*). Ferns have a wide geographical range, but are most abundant in humid, temperate, and tropical regions. In the tropical forests the tree-ferns rival the palms, rising sometimes to a height of 50 or 60 feet. Ferns are very abundant as fossil plants. The earliest-known forms occur in Devonian rocks. Various systems of classification for ferns have been proposed. At present the order is usually divided into about a dozen families distinguished by differences in the structure and arrangement of the sporangia. It is customary to separate the more primitive families with large massive sporangia, such as the Botryopteridaceæ (extinct) and Marattiaceæ, as *Eusporangiate* ferns from the more advanced *Leptosporangiate* types with small delicate sporangia. The largest division of *Leptosporangiate* families is that of the Polypodiaceæ, to which nearly all British ferns belong, such as the polypody, the lady-fern, the bracken, the hard-fern, the spleenwort, the maiden-hair, the hart's-tongue fern, &c. The royal fern, however, belongs to the Osmundaceæ. A few of the ferns are used medicinally, mostly as demulcents and astringents. Some yield food. *Pteris esculenta* is the edible bracken of New Zealand.

Ferozepor, a town, Punjab, India, with a large arsenal and a trade in grain; pop. 54,351. The district of Ferozepor has an area of 4286 sq. miles, a population of 959,657, and produces wheat, barley, and millet.

Ferrara, a city of Northern Italy, capital of the province of same name, 26 miles N.N.E. of Bologna, in a fertile but unhealthy plain. There is a trade in soap, wax, and silk, and a university founded in 1264. Pop. (1928), 117,221.—The province produces rice, grain, wine, hemp, silk, and fish. Area, 1019 sq. miles; pop. (1928), 364,482.

Ferreira, Antonio (1528–1569), Portuguese poet. He carried to perfection the elegiac and epistolary style, and added to Portuguese poetry the epithalamium, the epigram, ode, and tragedy. His tragedy of *Ines de Castro* is his masterpiece.

Ferret, a domesticated albino variety of the polecat (*Putorius fœtidus*), about 14 inches in length, of a pale-yellow colour, with red eyes. It is a native of Africa,



Ferret (*Putorius fœtidus*)

and is used in catching rabbits, to drive them out of their holes.

Ferrier, James Frederick (1808–1864), Scottish metaphysician. In 1845 he was appointed to the chair of moral philosophy at St. Andrews. His chief work is *The Institutes of Metaphysics*.

Ferrier, Susan Edmonstone (1782–1854), Scottish novelist. Her first novel, *Marriage*, appeared in 1818, and was extremely popular. *The Inheritance* appeared in 1824, and *Destiny, or the Chief's Daughter*, in 1831. No one has succeeded better in depicting the manners of the upper middle class in Scotland at a time when the national peculiarities were still in a great measure intact.

Ferro. See *Canary Islands*.

Ferrol, a fortified seaport of Northern Spain, in the province of Corunna, on a fine inland bay. The chief naval arsenal of Spain is here. Ships of all sizes can enter the harbour. There are dry-docks taking up to 22,000 tons, and there are coal and oil-fuel depots. The manufactures consist



chiefly of swords, cutlery, and military and naval equipments. Pop. 26,270.

Ferry, Jules François Camille (1832-1893), French statesman and writer. In 1879 he became Minister of Public Instruction. In 1880 Ferry, having become Premier, entered upon a vigorous foreign policy. His seizure of Tunis in 1881 was successful, though it led to his resignation; but when again Premier, in 1883, his expedition to Tonquin landed France in troubles through which (1885) he was driven from office. In 1893 he was elected President of the Senate, but soon after he was shot by a madman.

Ferry. The right of establishing a public ferry is usually the prerogative of a Government or Legislature. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. No one is allowed to establish a rival ferry so near the original one as to destroy its custom.

Ferula, a genus of umbelliferous plants employed in medicine, and natives of the Mediterranean coasts. *F. communis* of English gardens is called giant fennel.

Fescue, the popular name of a genus of grasses (*Festuca*) belonging to the division with many-flowered spikelets on long stalks. The best-known species, all of which are perennial, are meadow fescue (*F. pratensis*), hard fescue (*F. duriuscula*), both useful for agricultural purposes, sheep's fescue (*F. ovina*), and tall fescue (*F. elatior*). See Plate, *Grasses*.

Festiniog, a town of North Wales, in Merioneth, with slate-quarries; also a tourist centre. Pop. (1931), 9072.

Festivals. The festivals of the Christian Church owe their origin partly to those of the Jewish religion, such as Easter, which corresponds to the Passover of the Jews, and Whitsuntide, which corresponds to Pentecost: partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them into festivals of the Church. These festivals are divided into movable and immovable; the former those which in different years fall on different days, the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of

Advent Sunday, depends. Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday one week before Easter. Rogation Sunday falls five weeks, Ascension Day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maundy Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, 30th Nov., whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of Jan., Epiphany on the 6th of Jan., the feast of All-Saints on the 1st of Nov., the festival of All-Souls on the 2nd of Nov., and Christmas Day or the feast of the Nativity of Our Lord on the 25th of Dec.

Festus, Sextus Pompeius (second century A.D.), Roman grammarian. He is the author of an abridgment of a work by Verrius Flaccus called *De Verborum Significatione*, a kind of dictionary, which is very valuable for the information it contains about the Latin language.

Fetish, or Feticch, any object which is regarded with a feeling of awe, as having mysterious powers residing in it, but without any consciousness in the exercise of them. The fetish may be animate, as a cock, a serpent, &c.; or inanimate, as a river, a tooth, a shell. Fetish worship prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

Feu, Feu-holding, or Feu-farm, in Scottish law, a special kind of tenure by which land, usually a small piece of ground on which a building or buildings may be erected, is granted or transferred by the owner to be held perpetually from him as superior, on payment of an annual sum, commonly called the *feu-duty*.

Feudal System, that system by which land is held by a vassal on condition of fidelity, that is, in consideration of services to be rendered to his superior or feudal lord. When conquered lands came

to be apportioned and large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants on the same terms. As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right and the fief became hereditary. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. Thus the Crown became the source of all authority and possession in the country. The land which had once been 'folcland', or the land of the people, became the land of the king, from whom all titles to it were held to be derived. Such at least was the development of feudalism in England, where its centralizing tendencies, especially in the matter of holding land from the Crown, were strongly reinforced by the circumstances of the conquest under William the Norman. Under him and his immediate successors there was a struggle between royalty and the nobility, which ended in the power of the latter sinking before that of the kings. On the other hand, in Germany, France, and elsewhere on the Continent the disintegrating tendencies of feudalism as a system of government had full play. In these countries the weakening of the kingly authority encouraged the great feudal dukes and counts to set up an almost absolute independence, which in France was afterwards gradually lost as the monarchy grew stronger, but in Germany continued to divide the land down almost to our own times into a number of petty principalities.—Cf. J. T. Abdy, *Feudalism: its Rise, Progress, and Consequences*.

Feuerbach, Ludwig Andreas (1804–1872), German metaphysician. All transcendental ideas, such as God, immortality, &c., Feuerbach came to regard as deleterious illusions, and considered that the direct contact of the senses with things alone gave the full truth. His works

include: a *Critique of Hegel* (1839), *The Essence of Christianity* (1841; translated by George Eliot, 1854), and *The Essence of Religion* (1849).

Feuerbach, Paul Johann Anselm (1775–1833), German criminal jurist. Among his most interesting and important works are: *Merkwürdige Criminalfälle* and *Themis, or Contributions to the Art of Law-making*.

Feuillet, Octave (1812–1890), French novelist and dramatist. He came into notice about 1846 with his novels of *Le Fruit Défendu* and *Le Conte de Polichinelle*. In 1857 the appearance of *Le Roman d'un Jeune Homme Pauvre* raised Feuillet to the first rank of the novelists of the day. Amongst his other numerous novels are: *Monsieur de Camors* (1867), *Julia de Tréceur* (1872), *Le Sphinx* (1874), and *Histoire d'une Parisienne* (1881).

Fever, a diseased condition of the body characterized by an accelerated pulse, with increase of heat, deranged functions, diminished strength, and often with excessive thirst. Fever may be merely an accompaniment of some disorder. When primary it may be classified as follows: *Continued fever*, in which there is no intermission of the febrile symptoms till the crisis is reached. Simple fever, or febricula, typhus, typhoid (enteric or gastric) fever are examples. *Intermittent fever* or *ague*, in which there is a periodic cessation of the symptoms. *Remittent fever*, in which there is a short daily diminution of the symptoms. The condition known as hectic fever and yellow fever belong to this class. *Eruptive fevers*: (1) smallpox, (2) cow-pox, (3) chicken-pox, (4) measles, (5) scarlet fever, (6) erysipelas, (7) plague, (8) dengue fever.

Feverfew (*Pyrethrum Parthenium* or *Matricaria Parthenium*), a British composite biennial, frequent in waste places and near hedges. The plant was supposed to be a valuable febrifuge.

Fez, one of the several capitals of Morocco, 100 miles east of the Atlantic and 85 miles south of the Mediterranean. There are many mosques, one of them the largest in North Africa, and the city is one of the holy places of Islam. Fez is a place of considerable commercial importance, being the depot for the caravan trade from the south and east. The manufactures consist of woollen cloaks, silk handkerchiefs, leather, the red caps named *fezes*, carpets, and pottery. Fez was at one time famous

as a seat of Arabian learning. The population in 1926 was 81,172.

Fezzan, in the Sahara, a political division of the Italian province of Tripoli. It is surrounded by mountain chains, and consists of a great number of small oases. There are no rivers, but water is found in abundance at various depths. Wheat, barley, millet, figs, melons, and other fruits, tobacco, cotton, &c., are cultivated, but the chief wealth of the country is in its date-palms. Murzuq, the capital, is the point of junction for caravans from Timbuktu, Cairo, Tripoli, Sudan, &c. Pop. estimated at 70,000.

Fibrin, a peculiar organic compound substance found in animals and vegetables. Animal fibrin constitutes the solid matter which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus and other pathological fluids. Fibrin is a *protein* (q.v.), and is closely allied to albumin and casein. It is a very important element of nutrition. In healthy venous blood there is about 2·3 per cent, but its percentage is slightly more in arterial blood.

Fichte, Johann Gottlieb (1762–1814), German philosopher. His *Versuch einer Kritik aller Offenbarung* (Essay towards a Criticism of all Revelation, 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. After losing his chair owing to his unorthodox views, he went to Prussia, where he was appointed in 1805 professor of philosophy at Erlangen. In 1810, on the establishment of the university in Berlin, he was appointed rector and professor of philosophy. Amongst his best-known works are: *System der Sittenlehre* (Systematic Ethics), *Die Bestimmung des Menschen* (The Destination of Man), *Das Wesen des Gelehrten* (The Nature of the Scholar), *Grundzüge des Gegenwärtigen Zeitalters* (Characteristics of the Present Age), and *Reden an die Deutsche Nation* (Addresses to the German Nation).—BIBLIOGRAPHY: R. Adamson, *Fichte*; C. C. Everett, *Fichte's Science of Knowledge*.

Ficino, Marsilio (1433–1499), Italian philosopher. He is famous for his translation of Plato (1482), and for his treatise on the immortality of the soul.

Ficksburg, a town of the Orange Free State, South Africa, 120 miles east of Bloemfontein. It stands on the Caledon River at one of the chief entrances to

Basutoland, and has a very large trade. Pop. 3322.

Fiction, in law, is an assumption made for the purposes of justice, though the fact assumed could not be proved, and may be literally untrue. The rules by which the existence of legal fictions are limited have been stated as follows: (1) The fiction must have the semblance of truth. (2) It shall not be used to work a wrong. (3) It shall only be employed for the end for which it was introduced.

Field, Cyrus West (1819–1892), American capitalist. Having obtained a charter giving him exclusive right for fifty years of landing ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company. Attempts to lay cables were made in 1857 and 1858, but it was not till 1866 that a cable was successfully laid by the *Great Eastern*.

Fieldfare, a bird of the thrush genus (*Turdus pilaris*), about 10 inches long with ash-coloured head and black tail, appearing in Britain in winter.

Field-glass, a short double telescope of which the two parts are the same in construction, and are placed parallel to each other so that the axes of the eyepieces are at the same distance apart as the pupils of the observer's eyes. In the Galilean type of field-glass, the objectives are convex and the eyepieces concave lenses; this accounts for the shortness of the instrument. In a telescope with a convex eyepiece prisms are used.

Fielding, Anthony Vandyke Copley (1787–1855), English painter in water-colours. His pictures are chiefly taken from English scenery, the various features of which he has represented with great delicacy and truth.

Fielding, Henry (1707–1754), English novelist. He was educated at Eton, where he remained possibly until 1725. He began his literary career by writing a large number of farces, comedies, and burlesques. His first comedy, *Love in Several Masques*, was produced at Drury Lane, 12th Feb., 1728. Fielding then went to the University of Leyden, where he remained two years. In 1730 one of his most successful burlesques, *Tom Thumb*, was produced at the Haymarket. A revised and enlarged version of it was brought out the next year, under the name of *The Tragedy of Tragedies*. *Pasquin* (1736) and *The Historical Register* (1737) were two

most successful burlesques which turned the ministry into ridicule. So successful were these pieces that the ministry hastened to pass a Licensing Act which effectually muzzled Fielding. He entered the Middle Temple on 1st Nov., 1737, and was called to the Bar in June, 1740. In 1740 Samuel Richardson published his novel *Pamela*. Fielding saw that it would be amusing to burlesque this novel by writing in a similar manner about a hero instead of about a heroine. *The History of the Adventures of Mr. Joseph Andrews, and of his friend Mr. Abraham Adams* accordingly appeared in Feb., 1742. It ran far beyond its original design of being a burlesque, and became a novel of life and manners. In 1743 Fielding published a volume of *Miscellanies*. This contained the Lucianic *Journey from this World to the Next*, and the much more memorable *History of the Life of the Late Mr. Jonathan Wild the Great*. In 1748 he was appointed Justice of the Peace for the County of Middlesex, and for the City and Liberty of Westminster. In 1749 (28th Feb.) he produced his masterpiece, *Tom Jones*. To praise this, "the labour of some years" as he called it, is superfluous. Coleridge said that it had one of the three best plots in the world; and Byron called its author "the prose Homer of human nature". It is, indeed, a vast sort of comic prose epic. The introductory chapters in particular are models of good style and good sense. The third and last of the three great novels, *Amelia*, was published in Dec., 1751. It has a mellowness that is all its own. Fielding did not write much more, save a few pamphlets mostly on economic or legal subjects. His health began gradually to break up. In June, 1754, he left England and went to Lisbon to try to recover his health, but he did not succeed in so doing, and died 8th Oct., 1754. *The Journal of a Voyage to Lisbon* was posthumously published.

Henry Fielding is not only witty in himself, but "the cause that wit is in other men". His novels have been used as models by almost all the most distinguished of his successors, and have had a healthy influence on all subsequent fiction. His tolerance and his broad open-air humour are a sure cure for a mind diseased by the psycho-analytic and morbid fiction of a more recent period. — BIBLIOGRAPHY: Austin Dobson, *Fielding* (English Men of

Letters Series); G. M. Godden, *Henry Fielding: a Memoir*; W. L. Cross, *The History of Henry Fielding*.

**Field-marshal**, the highest military rank in Britain. It is conferred by selection upon a very few officers, chiefly for distinguished services or on the ground of royal descent. It was introduced into Britain by George II in 1736. In France the analogous dignity of *maréchal de France* was abolished in 1888, but was again revived during the European War.

**Field of the Cloth of Gold**, a place near Calais, celebrated for the meeting (7th June, 1520) between Henry VIII of England and Francis I of France.

**Fife**, one of the ten magisterial districts of Northern Rhodesia.

**Fife Ness**, the eastern extremity of Fifeshire, about 2 miles from Crail. Near it is a dangerous ridge of rocks known as the Carr Rocks, on which a beacon has been erected.

**Fifeshire**, a maritime county, Scotland, forming the peninsula between the Firths of Forth and Tay; area, 322,844 acres. The principal elevations are the Lomond Hills. The principal valley, called Strath Eden or the 'Howe (hollow) of Fife', watered by the Eden, is very fertile and highly cultivated. Very fertile also is the district lying along the shores of the Firth of Forth. But the north-eastern part, between St. Andrews and the Tay, and the north-western part are in general cold and poor. Fife is the second largest coal-producing county in Scotland. Iron, limestone, and freestone abound. The chief manufacture is linen, especially damasks, diapers, &c., principally at Dunfermline; floorcloth is largely made, more especially at Kirkcaldy. There are salmon and other fisheries. The principal towns are Kirkcaldy, Dunfermline, and St. Andrews; Cupar is the county town. Pop. (1931), 276,261.

**Fifth-monarchy Men**, a sect of politico-religious enthusiasts who during the Protectorate of Cromwell assumed to be "subjects only of King Jesus". They considered the revolution as the introduction to the *fifth* great monarchy which was to succeed to the four great kingdoms of Antichrist mentioned by Daniel.

**Fig** (*Ficus Carica*), a deciduous tree belonging to the order Moraceæ (mulberries). It is indigenous to Asia Minor, but has been naturalized in all Medi-



terreanean countries. It grows from 15 to 20 or even 30 feet high. In congenial climates it bears two crops, one in the early summer from the buds of the last year; the other (which is the chief harvest) in the autumn, from those on the spring growth. Figs, particularly dried figs, form an important article of food in the countries of the Levant. The best come from Turkey.

**Figaro**, a dramatic character first introduced on the French stage by Beaumarchais in his comedies *The Barber of Seville* and *The Marriage of Figaro*. The plays were adapted for Mozart's *Marriage of Figaro* and Rossini's *Barber of Seville*.

**Fighting-fish** (*Betta pugnax*), a small spiny-finned fish, native to the south-east of Asia, and remarkable for its pugnacious propensities. When the fish is irritated, it glows with metallic splendour.

**Figueras**, a town of Spain, in the province of and 21 miles N.N.E. of Gerona, near the French frontier, defended by a fortress reputed to be the strongest in Spain. Pop. 11,778.

**Fig-worts**, the common name of Scrophularia, and sometimes also applied to the Scrophulariaceæ, a large natural order of gamopetalous Dicotyledons, represented by the calceolaria, foxglove, veronica, &c.

**Fiji Islands**, a group, South Pacific Ocean, east of the New Hebrides, comprising about 250 islands, 80 of which are inhabited. The largest islands are Viti Levu (4112 sq. miles) and Vanua Levu (2432 sq. miles), and the total area is 7451 sq. miles. The coasts are almost surrounded by coral reefs, and there are many excellent harbours. Fish and turtle are plentiful. Most of the islands are extremely fertile, and almost everywhere the foliage is luxuriant. The coco-nut palm grows along the sea-shores, the bread fruit, banana, orange, and yam are abundant, and since the commencement of European settlement maize, rubber, tobacco, tea, and the sugar-cane have been introduced. Timber trees are plentiful. In 1922 the principal exports were sugar (71,731 tons), £1,342,874; copra (21,987 tons), £346,096; bananas (358,122 bunches), £45,717; and molasses. The total value of exports in 1922 was £1,698,544, and of imports £723,545. The Fijians are generally superior to the Polynesians. They are nearly all Christians, and educa-

tion is well advanced. The population of the group in 1921 was 157,266, including 3878 Europeans and 60,634 Indians. Suva, the capital, is situated on Viti Levu, and Levuka, on the Island of Ovalau, is the centre of the copra trade. After repeated requests by the Fijians, Great Britain annexed the islands in 1874 and made them a Crown Colony under a Governor, an executive council, and a legislative council. Native chiefs take part in the administration, and the old customary law is still adhered to.—BIBLIOGRAPHY: W. A. Chapple, *Fiji: its Problems and Resources*; A. G. King, *Islands Far Away*; Stewart's *Handbook of the Pacific Islands*.

**Fildes**, Sir Luke (1844–1927), English portrait and genre painter. His first picture was *Nightfall* (1868), and since then he has exhibited amongst other works: *The Loosened Team*; *The Empty Chair*; *Fair, Quiet, and Sweet Rest*; *Simpletons*; *Applicants for Admission to a Casual Ward*; *The Widower*; *The Return of the Penitent*; *The Village Wedding*; *Venetian Life*; *The Al-Fresco Toilette*; *The Doctor*; also state portraits of King Edward (1902) and of Queen Alexandra (1905).

**File-fish**, the name applied to species of Balistus living in warm and tropical seas. They grow to a length of 3 feet, and have an armour of lozenge-shaped bony plates. By means of their strong front teeth they can break off pieces of coral and crush the shells of bivalve molluscs.

**Filey**, a watering-place of England, on the coast of the East Riding of Yorkshire, 7½ miles south-east of Scarborough. Pop. (1931), 3730.

**Filicaja**, Vincenzo da (1642–1707), Italian poet. The publication of his odes, sonnets, &c., in 1684 established Filicaja's fame as the first poet of his time in Italy. Among his most successful poems are the *Canzone to John Sobieski* on the occasion of the relief of Vienna from the Turks.

**Fillmore**, Millard (1800–1874), thirteenth President of the United States. He became Vice-President of the United States in 1848. By the death of Zachary Taylor, in 1850, he was raised to the office of President, which he held till 1853.

**Filmy Ferns** (Hymenophyllaceæ), an order of ferns, chiefly found in tropical regions, the two species (*Hymenophyllum tunbridgense* and *H. unilaterale*) found in

Great Britain being the most widely distributed.

**Filtration**, the process of freeing a liquid from solid matter suspended in it by causing it to pass through some pervious substance or substances which catch and retain the solid matter. In domestic filters the simplest forms are those in which the water passes down by gravity through the filtering medium to a reservoir below. Filtration can be hastened by applying suction or pressure. The filters at waterworks are large tanks or beds, filled with layers of large stones, pebbles, coarse gravel, fine gravel, coarse sand and fine sand—the fine sand being at the top. The water in the reservoir is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed. Pressure filters are now in use containing the filtering media on perforated trays, through which the water is forced.

**Finance** may cover either 'public finance' or 'commercial finance'. By public finance is meant the measures taken by Governments, whether national or local, for the purpose of raising money to pay for the national or local services run by governmental agencies. Public finance is, therefore, an essential part of the functions of any Government. Most Governments spend large sums on public education and health, and on works of public development, while the demands of national defence entail heavy expenditure. In most civilized countries prior to 1914 the problem of raising sufficient revenue to meet State expenditure was growing increasingly difficult, and was giving rise to vexed discussions as to the proportion of revenue which should be contributed by owners of wealth paying 'direct taxes' levied on them in proportion to their capital wealth or money income, or by consumers paying 'indirect taxes' levied on commodities, in the form of internal excise or of import duties. In the United Kingdom 45 per cent of the national revenue was raised by direct taxation, and 43 per cent by indirect taxation, in 1913, the proportion in 1920 being 48 per cent and 25 per cent respectively. The difficulty of raising both ends meet has been much intensified in all countries which took part in the war of 1914-1918 by the gigantic expenditure

caused by the war. A serious burden of war debts remains. The National Debt of the United Kingdom, and the 'debt charges' (including sinking fund for the reduction of the debt), amounted in 1913-1914 to £706,154,110 and £24,500,000 respectively. The corresponding figures in 1929-1930 were £7,596,200,000 and £369,000,000. In this country national finance is regulated by the 'Budget', which is in effect a balance sheet of estimated revenue and expenditure presented to the House of Commons annually in April by the Chancellor of the Exchequer, and covering the financial year, which ends in March. The Budget contains estimates of the national expenditure and national revenue under various heads, and its introduction is made the opportunity of introducing changes in taxation. For the year 1913-1914 the actual expenditure was £197,493,000, and the actual revenue was £198,243,000; for the year 1928-1929 they were £818,000,000 and £836,500,000 respectively. For 1930-1931 the Budget estimates were for an expenditure of £787,209,000 and a revenue of £789,445,000. Taxation per head of population in the United Kingdom amounted in 1914 to under £4, in 1920 to about £23, and in 1926 it was estimated at a little under £15. The amount of money raised by local taxation is not included in this figure. Local authorities raised considerably over £188,000,000 in 1929, local taxation taking the form of a tax on the annual value of real property within the area concerned.

**Finance** in the other sense covers all dealings in 'wealth' in the form of money and in credit instruments. The business of 'finance' consists mainly in the collection from persons or businesses saving money, or holding it in reserve, of funds for which they have no immediate use, and the lending of the money thus obtained to persons or businesses engaging in enterprises which are sufficiently safe for them to be able to obtain loans, but for which they have not themselves sufficient money available. In internal trade this financing of businesses is largely done by banks. In foreign trade the most frequent method of financing is through the medium of 'bills of exchange', ordering payments for goods at a future date, perhaps two, three, or six months ahead. A bill of exchange, if the names of the

parties to it or some of them are satisfactory, will be discounted by a bank, or by a discounting house for the present value of the sum of money accruing when the bill falls due. The result of this operation is that the concern selling the goods can secure immediate payment, while the concern buying the goods, against which the bill is 'drawn', does not require to make any payment until the maturity of the bill. The bill of exchange has become the chief means of settling all forms of indebtedness between different countries (see *Foreign Exchanges*). Yet another form of finance is the raising of capital for joint stock undertakings by public subscriptions, in return for which 'shares' or 'stocks' in the undertaking are given. Various types of shares and stocks are offered to the public, e.g. debentures, preference, and ordinary. Debentures carry practically no risk, preference shares or stock a limited risk, ordinary shares most of the risk of the undertaking. When shares or stocks are being offered to the public for subscription, arrangements are frequently made for 'underwriting' the issue. In this way the company issuing the shares or stocks is guaranteed that the cash shall be forthcoming; for the 'underwriters', in return for a small commission, agree to take up themselves any portion of the issue not subscribed for by the public. Should the underwriters have to take up some part of the issue, they await an opportunity of disposing of it in the ordinary market.

**Finch**, one of the Fringillidae, a large family of small seed-eating perching birds, distinguished by having a sharply pointed, conical bill, suitable for crushing seeds and other hard objects. The species have been divided among several sub-families.

**Findhorn**, a Scottish salmon river which flows through the counties of Inverness, Nairn, and Moray, and falls into the Moray Firth after a course of 62 miles.

**Findlay**, a city of the U.S.A., in Ohio. It possesses petroleum springs and natural gas, and has machine-shops, flour-mills, sawmills, and potteries. Pop. 17,800.

**Findon**, a fishing-village, Kincardineshire, Scotland, about 5 miles south of Aberdeen, celebrated for its smoke-cured fish known as Findon or Finnan haddocks. Pop. 200.

**Fine**, in English law, formerly signified a sum of money paid at the entrance of

a tenant into his land and on other occasions, but now generally has the signification of a pecuniary penalty exacted either in punishment of or in compensation for an offence.

**Fingal**, a hero of an epic poem attributed to Fingal's son Ossian, first published by James Macpherson in 1762. See *Ossian*.

**Fingal's Cave**, a famous natural cavern in the Island of Staffa, one of the Western Islands of Scotland. It is composed of lofty basaltic columns, is 227 feet deep, and about 66 feet high.

**Finger-prints**, as a means of identification, were first called attention to in 1823 by Purkinje, the eminent physiologist of Breslau. The first practical application of the method was made in the Hooghly district of Bengal by Sir William Herschel. Sir Francis Galton subsequently took up the subject of finger-prints, or *dactylography*, as a study, and found that the innumerable ridge-patterns and characteristics noticeable on the ball of the thumb and fingers are not alike in any two persons, and persist during the whole period of human life, and that thus an accurate means of identification is afforded by simply inking the under surface of the hand and taking an impression on paper. There is now a special department for finger-print records at Scotland Yard.

**Fingers and Toes, Club-root, or Clubbing**, a disease or malformation in the bulb of the turnip, which forms numerous galls or tumours, and becomes hard and useless. It is due to the attack of a parasitic slime-fungus, *Plasmodiophora Brassicæ*.

**Finistère**, a department of France; area, 2728 sq. miles. The coast-line is bold and precipitous, and the interior is traversed by hills. The soil is generally fertile and well cultivated; fishing is extensively carried on; and the minerals are of considerable importance, including iron, zinc, bismuth, and lead. The manufactures consist chiefly of sail-cloth, linen, soap, oil, candles, ropes, leather, paper, and tobacco. Shipbuilding also is carried on, and the general trade is extensive. Quimper is the capital; other towns are Brest, Châteaulin, and Morlaix. Pop. (1926), 753,702.

**Finisterre**, Cape, the most western cape of Spain, on the coast of Galicia.

**Finland**, a European Republic situated

on the Baltic Sea, and bounded by Russia, the Arctic Ocean, Norway, Sweden, and the Gulfs of Bothnia and Finland. The total area is 132,608 sq. miles, and the pop. of (1928) 3,611,791 is 90 per cent Finns, 9.5 per cent Swedes, and includes a few thousand nomadic Lapps. The coast-line, which is highly indented, is fringed with islands, the Åland group being the most important. The country consists of a great plateau with low coastlands and, in the north, rugged offshoots of the Scandinavian ranges. The south is sandy and marshy, and occupied by thousands of lakes which, being connected with each other and with the Gulf of Finland by canals, form an excellent transport system. The rivers are short and broken by rapids, but are much used for floating timber. The chief towns are Helsingfors (the capital), Åbo, Viborg, Vasa, Uleåborg, and Tammerfors. All of these except Tammerfors are busy ports, though only Helsingfors and Åbo are open in winter. The climate is severe but healthy. Three-fifths of the population are engaged in agriculture, though only some 5,000,000 acres are in crop. The chief products are rye, barley, oats, and potatoes. A great deal of butter is exported. Lumbering is the main industry, and 55 per cent of the total area is forest land (mostly Government owned). There are about 600 sawmills. Wood industries, iron goods, textiles, and paper occupy about 4000 large factories employing 170,000 hands. In 1929 the total value of exports was 6,427,000,000 Finnish marks. This was chiefly composed of timber, pulp and paper, butter, animal food-stuffs, matches, and hides. Imports (tea, coffee, sugar, machinery, &c.) had a total value of 6,996,000,000 Finnish marks. The commerce with Great Britain was larger than that with any other country. The coinage standard is gold, and the unit is the *markka*, stabilized at 39.70 to the American dollar.

Finland became an autonomous Grand Duchy of Russia in 1809, and was perhaps the most independent part of that empire. By the Constitutional Law of 1906 the House of Representatives consists of one chamber chosen by proportional election, and at the same time the suffrage was extended to women. The independence of Finland was declared in 1917, and the amended Constitution provided for a President and a Council of State (Ministry).

The national religion is Lutheran (3,300,520 adherents), and there are 54,000 Greek Catholics. Elementary education is free and compulsory, and there are numerous secondary and technical schools, and schools of forestry, agriculture, commerce, navigation, &c. There are three universities, one at Helsingfors, founded at Åbo in 1640 and removed in 1827, and two (Swedish and Finnish) at Åbo, founded in 1919 and 1922 respectively. Army service is universal and compulsory, and there is also a Civic Protective Force. The navy is of little importance, and is mainly for coast patrol and ice-breaking work. The mercantile marine has a total net tonnage of about 550,000. See *Finns*.—BIBLIOGRAPHY: *The Republic of Finland; an Economic and Financial Survey*; J. Öhqvist, *Finland*; Th. Homen, *East Carelia and Kola Lapmark*; *Finland* (Foreign Office Peace Handbooks). See map under *Baltic States*.

**Finland, Gulf of**, a great arm of the Baltic, 250 to 260 miles long, and from 10 to 70 miles wide, stretching from west to east between Finland on the north and Estonia on the south.

**Finlay, George** (1799–1875), British historian. His chief work, the *History of Greece from its Conquest by the Romans to 1864*; was published in sections under different titles: *Greece under the Romans*, *History of the Byzantine Empire*, *History of Greece under the Ottoman and Venetian Domination*, and *History of the Greek Revolution*.

**Finmark**, a division of Norway, in the extreme north, lying between Lapland and the Arctic Ocean. The coast is very much indented, and the division includes the Lofoden Islands. Fishing, the making of cod-liver oil, and reindeer-breeding are the chief occupations. Hammerfest is the capital. Area, 18,539 sq. miles; pop. 44,190.

**Finns**, in their own language called *Suomalainen*, are a race of people inhabiting the north-west of European Russia (governments of Archangel and Olonetz), but especially Finland. In a wider sense the term Finns, with its adjective Finnish, is applied to one of the chief branches of the northern or Ural-Altaic divisions of the Turanian family of peoples and languages. The Ugro-Finnic family has been divided into four groups or branches: (1) the Ugrie, to which the Ostiaks, Voguls, and Magyars belong; (2) the Bulgaric or



Volgaic, consisting of the Tsheremisses and the Mordvins; (3) the Permian, composed of the Permians, Sirianes, and Votiaks; and (4) the Tchudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Estonia and the Lives or Livonians, the Tchudes in the governments of Novgorod and Olonetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway.

**Finnish Language and Literature.**—The Finnish language belongs to the Ugro-Finnic division of Turanian or Ural-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Magyars. Finnish literature is valuable chiefly for its rich stores of national poetry. These poems, which had been preserved by oral tradition from the times of heathendom, were gradually dying out till 1835, when Lönnrot grouped together in one whole all the fragments he could lay his hands on and published them, under the title of *Kalevala*, as the national epic of the Finnish people. A great impulse was given to the cultivation of the language in modern times. Recognized as an official language side by side with Swedish, it is becoming more and more the vehicle for imparting instruction. Works on science and history as well as poetry have been written in Finnish in recent years. Among modern Finnish writers are: Yrjö-Koskinen, Alexis Stenwall, Erkko, Canth, Ingman, and Pakkala.—**BIBLIOGRAPHY:** C. Eliot, *Finnish Grammar*; C. J. Billson, *Popular Poetry of the Finns*; Comparetti, *Traditional Poetry of the Finns*.

**Fins.** See *Ichthyology*.

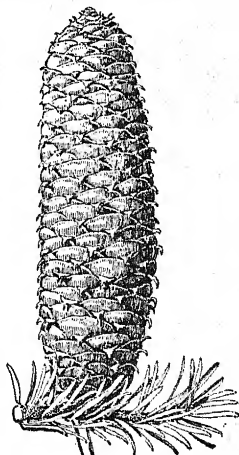
**Finsbury**, a borough of London. Pop. (1931), 69,888.

**Finsen Treatment**, a surgical method introduced by a Danish doctor, Niels Ryberg Finsen (1860–1904), which consists in the treatment of certain diseases, especially those of a tubercular nature—such as lupus—by the application of the chemical rays of light in a concentrated form, the light being either that of the sun or the electric light and special apparatus being required.

**Finsterwalde**, a town in the province of Brandenburg, Prussia, with manufactures of cotton and woollen cloths. There are several iron-foundries and machine-shops. Pop. 18,100.

**Fiord**, a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly shaped inlets of the sea, such as diversify the coast of Norway. Similar inlets of the sea are found in Scotland, British Columbia, and New Zealand.

**Fir**, a name sometimes used as co-extensive with the term *pine*, and including the whole genus *Pinus*; more properly restricted to trees of the genus *Abies*, which differ from the pines in that their leaves grow directly on the stems. The term fir, thus limited, is applied to the different varieties of the *silver fir* (*Abies pectinata*), the *balm of Gilead fir* (*A. balsamifera*), and the *large-bracted fir* (*A. nobilis*). The *Scotch fir* is a species of pine (*P. sylvestris*).



Fir Cone

**Firbolgs**, one of the legendary or fabulous tribes of the earliest period of Irish history. Some of the Irish historians begin their account of the Irish monarchy and list of kings with Slainge, the first Firbolg king, who began to reign 1934 B.C.

**Firdusi**, or **Firdausi**, Abul Kasim Mansur (c. 931–1020), the greatest epic poet of the Persians. Firdusi produced an historical poem of 60,000 verses entitled *Shāhnāma* (Book of the Kings). No work in the Persian language can be compared with it. It abounds in rich imagery, contains many passages of splendid poetry, and is of great interest to historians and ethnologists. A French translation of the *Shāhnāma* by Mohl, with the Persian text, was published by the French Government between 1831 and 1868. There are English translations by J. Atkinson, A. G. Warner, and A. Rogers.

**Fire-arms Act, 1920**, prohibits any person under 14 years of age, and any other person to whom a police certificate (known as a 'fire-arm certificate') has not been

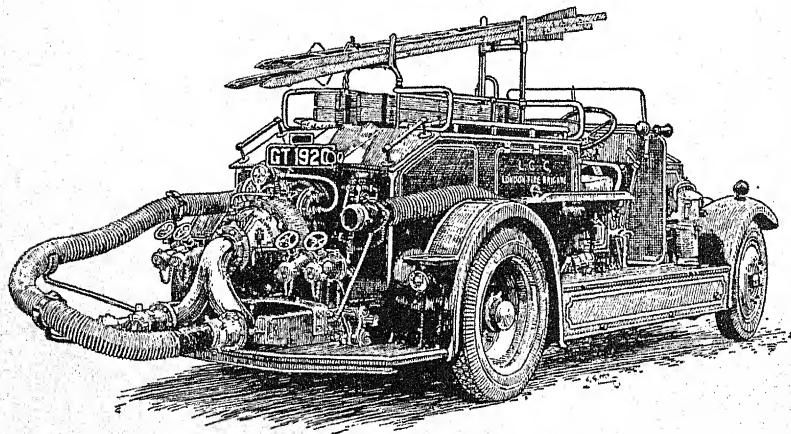
granted, from purchasing, possessing, using, or carrying any fire-arms or ammunition. Soldiers, gunsmiths, and various other persons are exempt from the obligation to hold certificates in respect of fire-arms or ammunition carried, used, or possessed in the course of duty or business. The fee payable for a certificate is 5s.; it continues in force for three years, and is renewable for the like period from time to time at a cost of 2s. 6d.

**Fire-ball.** See *Lightning; Meteor.*

**Fire-clay** is the name given to the clay used in the manufacture of bricks intended

The safety-lamp affords the chief protection against this danger.

**Fire-engine**, an engine for throwing water to extinguish fires and save buildings. The pump draws its water through a flexible suction-pipe, which is placed either in a portable cistern kept supplied by buckets or hose, or other source of supply. In large towns the suction-pipe is connected to the street hydrants, the engine thus being used to increase the pressure already existing in the water-main. The manual fire-engine was the first type in use. The steam fire-engine



Motor Fire-Engine

By courtesy of Messrs. Merryweather & Sons Ltd.

to withstand high temperatures. Fire-clays usually need temperatures exceeding  $1500^{\circ}\text{C.}$  to fuse them, and it is essential that they shall contain no matter which is likely to promote the formation of fusible silicates. Analysis of one specimen gave the percentage composition as: silica, 55.6; alumina, 27.5; oxide of iron, 1.9; lime, 0.3; magnesia, 0.8; potash, 0.8; titan acid, 0.3; combined water, 10.0; moisture, 2.1.

**Fire-damp** is the miners' name for methane,  $\text{CH}_4$ . When it constitutes more than  $\frac{1}{4}$ th of the volume of the atmosphere of mines, the whole—with the fine coal-dust added—becomes highly explosive.

came into prominence during the latter half of the nineteenth century. The latest types of fire-engines are motor propelled. The illustration shows a modern petrol-driven 'Hatfield' motor fire-engine. The fire-pump on this machine is of the treble-barrel reciprocating type, driven by a single crank; several sizes are made, ranging from 150 to 600 gallons capacity per minute, with motors of from 30 to 70 horse-power. The petrol-motor, in addition to propelling the vehicle along the road, drives the pump through silent chain gearing.

**Fire-extinguishers.** Chemical fire-extinguishers are machines or vessels by

means of which an extinguishing fluid may be projected on the fire, the pressure required to project the fluid being generated by chemical action or by the release of compressed gas. For small outbreaks of liquid combustibles, sawdust is effective, even more so than sand; for larger outbreaks contrivances using carbon tetrachloride or carbonic acid gas are in use. A protective system widely used for large buildings consists of water piping fitted with numerous orifices sealed with metal of low melting-point. When fire breaks out the metal fuses, and allows the water to escape at the point where it is wanted. The pipes are connected to a tank and force pump, which automatically keep up the supply of water.

**Firefly**, a name popularly given to any winged insect which gives out light. Except the lantern-fly, the fireflies are all beetles, and are members of two nearly allied families, the Elateridæ or skipjacks, and Lampyridæ, to which the glow-worm belongs. True fireflies are found only in the warmer regions of the earth. The *Elater* or *Pyrophorus noctilucus* of South America and the West Indies is one of the most brilliant, giving out its light from two eye-like tubercles on the thorax.

**Fire of London, The Great**, broke out in a house near London Bridge, 2nd Sept., 1666, and raged for several days. Two-thirds of London was destroyed — 89 churches and more than 13,000 dwelling-houses.

**Fire-raising**, in Scots law, the same as arson in English law. See *Arson*.

**Fire-works** are of various types. Some are fired whilst held in the hand, or set off on the ground; others, such as rockets, are projected by the aid of a small explosive carried within themselves, and explode in the air. Others, heavier and more showy, such as shells, are projected from a small grenade or mortar, similar to a trench mortar. Lastly there are what are known as 'set-pieces' or fire-work pictures. Amongst fire-works of the first kind may be mentioned rockets, wheels or whirling-gigs, and Bengal lights. Rockets are charged on what is known as the spindle system, a long steel needle penetrating the paper tube that holds the charge. After the tube has been filled, and the spindle withdrawn, a cavity remains, which after the explosion becomes filled with

the expanded air, causing the ascent of the rocket.

The following are some of the ingredients used: oxalate of soda, regulus antimony, nitrate of lead, picrate of ammonia, subchloride of copper, and carbonate of strontia; also methylated spirits and iron or steel filings. Colour effects are produced by salts of various metals, sodium giving a yellow light, calcium a red, strontium a crimson, and barium a green. Magnesium powder and lycopodium are used for giving lightning effects in stage pieces. Life-saving rockets carry a line from the shore to a wrecked ship, or from ship to shore. Fire-works are much used for signalling purposes. Rockets and ground-flares played a big part in the European War, and were used as signals everywhere. The S.O.S. was usually a combination of coloured rockets, commonly known as Very lights, which were fired from a specially made pistol. See *Rocket*.

**Fire-worship**. The highest type of this worship is seen in the adoration of the sun, not only as the most glorious visible object in the universe, but also as the source of light and heat. In the early religion of India the sun appears in the form of the god Agni. In the Vedic hymns Agni is the god of fire, corresponding to the Greek Hephæstos (Vulcan). In the East the worship of the element of fire was practised by the ancient Persians or Magians, and is continued by the modern Parsees. The establishment of this species of idolatry among the Persians is ascribed to Zoroaster, who taught his disciples that in the sun and in the sacred fires of their temples God more especially dwelt, and that therefore divine homage was to be paid to these.

**Firozabad**, a town in Agra district, in the United Provinces of India. Pop. 16,000. Pop. of *tahsil* or revenue district, 108,521.

**First-aid to the Sick and Injured**. The term First-aid is the expression used to denote the temporary treatment of persons suffering from sudden illness or the effects of accident, pending their being placed under medical care. Its objects are twofold; first, as far as possible to alleviate suffering; second, to prevent the aggravation of the injury or illness by injudicious handling. It may be necessary at times, as in the case of a street accident, to remove the injured person out of the

way of traffic, but this should be done with the greatest care, as any rough or careless handling may seriously aggravate the injury. As a general rule the person with a knowledge of first-aid will endeavour to ascertain the nature of the injury or illness and to apply the necessary treatment before moving the patient. The treatment, if intelligently applied, will, in the case of many injuries, do much to lessen the suffering of the injured person.

The course of training in first-aid as laid down by the St. John and the St. Andrew's Ambulance Associations, and followed by the bodies which have, in more recent times, taken up this branch of education, embraces instruction in elementary anatomy and physiology, the symptoms and practical treatment of cases of sudden illness such as fits, fainting, and apoplexy, and of all cases of accident embracing fractures, wounds and hæmorrhage, burns and scalds, choking, shock, and minor injuries, as well as the symptoms of and antidotes to poisons accidentally or deliberately administered, and, lastly, the methods to be adopted for the transport of the injured. It must be emphasized that first-aid must necessarily be merely a temporary and palliative measure. If it were generally to be supposed that first-aid treatment were more than a temporary safeguard pending the earliest possible surgical or medical attention, it would be better never to teach it. It is true that there are cases of minor illness or accident which scarcely necessitate medical attention, but in ninety-nine cases out of a hundred the first-aiders must remember that his duty, first-aid having been performed, is to get his patient to hospital or under the care of a doctor with all the speed he may.

Systematic instruction in the theory and practice of first-aid was established in England by the St. John Ambulance Association in the year 1877, and was extended to Scotland in the year 1879. The St. Andrew's Ambulance Association was formed in Scotland in 1882. Since 1908 the St. John Ambulance Association has confined its work entirely to England, and the St. Andrew's Association has had entire control over work of this kind in Scotland. The St. Patrick Ambulance Association was instituted in Ireland in 1912.

**First Offenders.** The Probation of

Offenders Act, 1907, empowers the court, in view of the character, antecedents, age, health, or mental condition of an accused person, or of the triviality of the offence, or of the extenuating circumstances under which the offence was committed, and of the inexpediency of inflicting punishment, (a) in the case of an offence chargeable before a court of summary jurisdiction, not to proceed to conviction, but either to dismiss the charge or to discharge the accused on his being bound over to be of good behaviour and to appear for conviction and sentence if called upon within such time (not exceeding three years) as the court may appoint; and (b) in the case of a conviction on indictment of an offence punishable with imprisonment, not to proceed to sentence, but to bind the accused to be of good behaviour and to appear for sentence if called upon within such period (not exceeding three years) as the court may specify. For the period specified the offender may be placed under the supervision of a 'probation officer', who is named in the order by the court, and whose duties, subject to the direction of the court, are (a) to visit the offender at intervals and to report; (b) to see to the observance of the conditions laid down by the court; (c) to advise, assist, and befriend the offender; and (d) if necessary to find him suitable employment.

**Firth**, an estuary, a term applied in Scotland to arms of the sea, such as the Firth of Clyde, of Tay, and of Forth, &c.

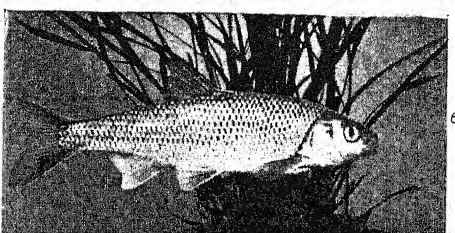
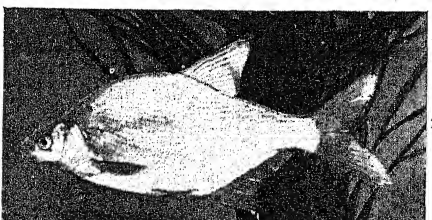
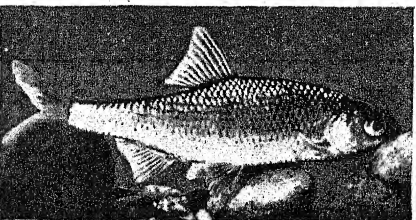
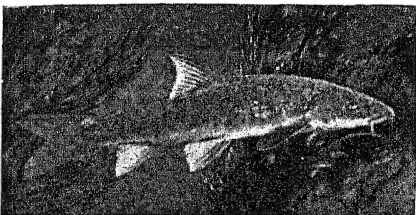
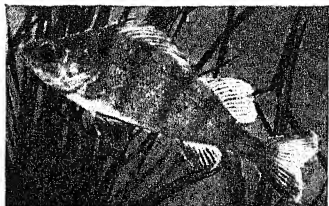
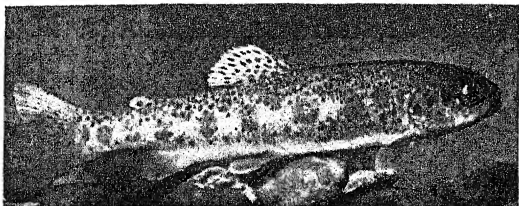
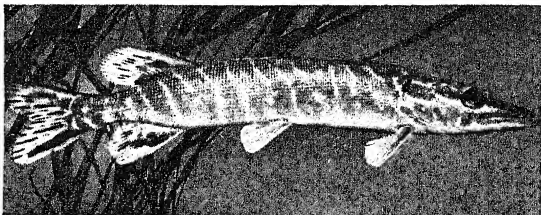
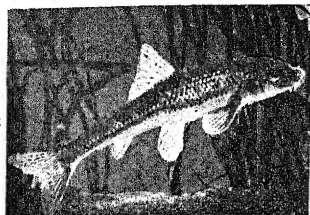
**Fischart**, Johann (c. 1545–1591), German satirist. His most celebrated works are a rifacimento of the *Gargantua* of Rabelais, *Das glückhafte Schiff von Zürich* (The Lucky Ship of Zurich, 1576), and about fifty others.

**Fischer**, Ernst Kuno Berthold (1824–1907), German philosopher. He belonged to the modified Hegelian school, and greatly popularized Kant's philosophy. His works include: *Logic and Metaphysic, or the Doctrine of Science* (1852); *Francis Bacon and his Successors* (1856); and *The Life and Character of Benedict Spinoza* (1865). His most important work, however, is his *History of Modern Philosophy* (1852–1894; new edition, 1897–1903).

**Fisher**, Herbert Albert Laurens (1865–), British historian and politician. In 1912 he was appointed vice-chancellor of the University of Sheffield, retaining his post until 1916, when he became President

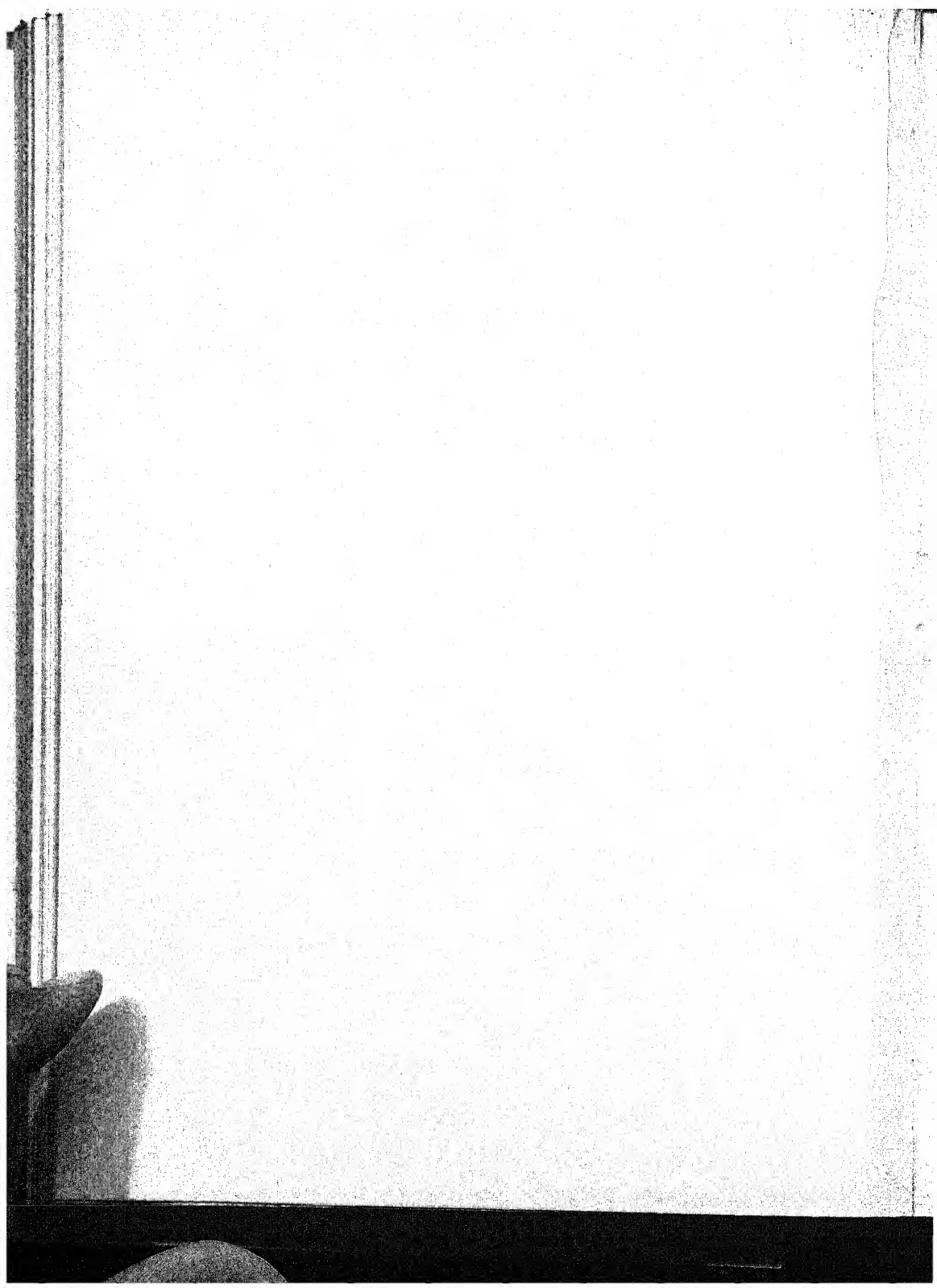


# BRITISH FRESH-WATER FISHES



1. Gudgeon. 2. Rainbow Trout. 3. Barbel. 4. Roach. 5. Chub. 6. Dace. 7. Silver Bream.  
8. Common Carp. 9. Perch. 10. Pike.

Photographs by S. C. and W. B. Johnson



of the Board of Education (1916-1922). He introduced the Education Act of 1918. He became Warden of New College, Oxford, in 1925. He resigned from Parliament in 1926 and in 1928 was made President of the British Academy. His works include: *The Medieval Empire*, *Napoleon*, *Studies in History and Politics*, and *Our New Religion*.

Fisher, John (1469-1535), Bishop of Rochester. He was largely responsible for the foundation of Christ's College (1505) and St. John's College (1511) at Cambridge. He opposed Henry VIII's divorce and the royal supremacy. His appointment as cardinal led to his execution.

Fisher, John Arbuthnot Fisher, first Baron (1841-1920), British admiral. At the age of fourteen he entered the navy, and served in the Baltic during the Crimean War. He was present at the bombardment of Alexandria in 1882. He was Director of Naval Ordnance from 1886 to 1891, and a Lord of the Admiralty from 1892 to 1897. He was Commander-in-Chief of the Mediterranean Fleet from 1899 to 1902, Second Sea Lord from 1903 to 1904, and First Sea Lord from 1904 to 1910. He introduced the *Dreadnought* policy and the plan of scrapping old ships instead of keeping them on the Navy List. He resigned his post on account of the severe criticism of Lord Charles Beresford. In 1912 Lord Fisher acted as chairman of a Royal Commission on oil-fuel. Reappointed First Sea Lord in 1914, he resigned on 14th May, 1915, in consequence of a disagreement with Mr. Winston Churchill, then First Lord of the Admiralty. He became chairman of the Inventions Board in 1915.

Fisheries. The chief fisheries of the world are those of Britain, the United States, Canada, and Newfoundland; but most of the countries that bound the North Sea, the Baltic, and the Mediterranean have a considerable interest in the produce of the waters. French fisheries at home and abroad have developed considerably in recent years, and in the East, Japan has been conspicuous as a great fishery nation, a fact that has much to do with the rapid growth of her naval power. It is important to note that in many parts of the world where fishery resources are enormous, very little development has taken place. This is due to lack of markets, distance from markets,

and local considerations (e.g. the caste difficulties in India). Strenuous efforts are now being made to establish an industry, especially in South Africa, Australia, and New Zealand. Distance has been successfully combated by the new brine-freezing system, and there are already signs in those countries of the rise of such subsidiary industries as fish-canning, isinglass manufacture, and the distilling of oils.

The products of our fisheries form an important part of the food-supply of the British Isles. Before the European War the annual value of the take, exclusive of shell-fish, was put down as above £14,000,000. During the European War there was of course a great fall-off in the catches, but an enormous increase in values. On the conclusion of peace the fishing industries passed through a very critical period, prices fell, wages increased, and expenses of transport and distribution became very heavy. The herring fisheries suffered more than the others, since the enormous export trade, especially to Germany and Russia, had practically ceased. The Government-guaranteed price to herring fishermen was withdrawn in 1921, and the position seemed hopeless. Fortunately, however, a revival of the export trade began, and the increase in subsequent years placed the industry on a sounder basis. The shell fisheries, too, came through a period of depression, largely owing to the fact that the public began to realize that enteric fever may be due to the eating of shell-fish taken from sewage-polluted waters. In the United Kingdom the only freshwater fish of much importance commercially are the salmon and the eel; and these are both only part-time dwellers in fresh water. Salmon are chiefly caught when making for, or actually ascending, rivers with a view to spawning. They are taken by various forms of net or by artificial flies or other lures. Eels leave the fresh water when about to spawn, and are generally caught when starting on this migration. They are captured in traps and nets as well as by hooks. The Board of Agriculture and Fisheries has a station for the capture and distribution of young 'elvers' at Epney-on-Severn. The sea fisheries of the United Kingdom have developed greatly in recent years. Sailing vessels have to a large extent been replaced by mechanically-propelled craft; 'steam-liners' and 'steam-

drifters' can now visit distant waters, and the actual fishing operations are under complete control, being no longer dependent on the wind. The effectiveness of the gear has also been increased by the development of the beam-trawl and the otter-trawl. Wireless telegraphy is now of great value to the fishing fleets, and the method of preserving fish in brine-tanks is in extensive use. Steam carrying vessels are frequently made use of to convey to market the catch of a fleet of smacks that continue for many weeks on the fishing-grounds. All this has involved the steady deterioration of the 'inshore' fisheries. In the European War inshore fishermen rendered enormous service to the country, and now their value is being appreciated, and various plans are being revived or initiated for helping them. In 1913 a Committee appointed by the President of the Board of Trade favoured an extension of the scheme for assisting fishermen to buy motors, and emphasized the necessity for the immediate formation of a Fisheries Organization Society, to promote co-operation amongst fishermen. This society was formed in 1914, and is now doing admirable work. Since the European War the Development Commissioners have made advances of money to the Board of Agriculture and Fisheries, to the Fishery Board for Scotland, and to the Congested Districts Board for Ireland for the building of boats, the provision of motors, and other assistance to the struggling inshore fishermen. But the inshore fisheries are not the only ones that have shown a tendency to decline, and, to quote the words of the Tenth Report of the Development Commissioners (1920), "every maritime country has by now discovered that the depredations of man have their effect—which is very marked in the case of some fish—on the population of the sea". Accordingly there has been general recourse to scientific study of fish. Before the European War an International Council for the Exploration of the Sea had been formed with a view to securing co-operative scientific research among the nations which fish the seas of Western Europe. Nine Powers were represented on this Council, which met again in 1920 and took up the threads that were dropped in 1914. Experiments in the transplantation of plaice from inshore waters to the Dogger Bank have demonstrated that

growth can be greatly accelerated by liberating the fish on rich feeding-grounds. The question whether the protection of immature fish would lead to a great increase in the number of mature adults has been debated, and it is likely that a settlement of this most important controversy will be possible, as the diminution of fishing in the North Sea during the European War has provided the necessary conditions for testing the facts. The feeding habits, the migrations, and the spawning seasons of fish have all been investigated with good results, and already we have investigations published by the Board of Agriculture and Fisheries, aiming at showing how the fluctuations in catches of such fish as pilchards, herring, and mackerel can be referred to changes in the physical and chemical nature of our seas.—BIBLIOGRAPHY: *Fisheries in the Great War*, being the Report on Sea Fisheries for the years 1915, 1916, 1917, and 1918 of the Board of Agriculture and Fisheries; Professor J. Johnstone, *British Fisheries*; J. T. Jenkins, *The Sea Fisheries*; the Annual Reports of (a) The Board of Agriculture and Fisheries, (b) The Fishery Board for Scotland, and (c) The Lancashire Sea-Fisheries Laboratory.

Fishguard, a seaport in Pembrokeshire, Wales, at the head of Fishguard Bay. An entirely new port and connected works were constructed here in 1906 by the Great Western Railway in connexion with the opening of a route to Southern Ireland (by Rosslare). There is now a wharf for ocean liners. Pop. (1931), 2963.

Fish-louse, or Sea-louse, a name for several crustaceans of the order Copepoda, parasitic on fishes. *Argulus foliaceus* is found on freshwater fishes, and even on tadpoles.

Fissurellidæ, the keyhole limpets, a family of sea-snails like limpets in appearance but with considerable structural differences. The species are widely distributed; some are British and many fossil.

Fistula, in surgery, an abnormal channel, usually caused by the bursting of an abscess, which connects some hollow organ with the surface, such as an anal fistula (a passage from the lower bowel to the skin near the anus), or establishes a communication between two hollow organs, such as the bladder and bowel.

Fitchburg, a city of Massachusetts, U.S.A., 40 miles north-west of Boston; it



has manufactures of paper, machinery, and woollen goods. Pop. 40,507.

**Fitzgerald, Edward** (1809-1883), English poet and translator. He was a friend of Tennyson, Thackeray, and Carlyle. He spent a retired life in Suffolk, occupied with books and boating. His chief work is a translation of *The Rubáiyát* of Omar Khayyám, the Persian poet (1859). His *Letters and Literary Remains* were published in three volumes in 1889 by his friend and literary executor, W. Aldis Wright.

**Fitzgerald, Lord Edward** (1763-1798), Irish rebel. In 1796 he joined the United Irishmen, and plotted for a French invasion of Ireland; was betrayed by a spy, and arrested. He was disabled by a pistol-shot, which caused his death before he could be brought to trial.

**Fitzgerald, Lord Thomas**, known as 'silken Thomas' (1513-1537), Irish rebel. He was vice-deputy for his father, the ninth Earl of Kildare, on whose arrest by Henry VIII Lord Thomas raised a revolt in Ireland, which was put down by Skeffington. Lord Thomas and his five uncles were hanged at Tyburn.

**Fitzroy, Robert** (1805-1865), English admiral and meteorologist. From 1828 to 1836 he was employed in hydrographical surveys, and in forming a chain of meridional distances round the globe. On his return he published *Narrative of the Surveying Voyages of H.M. Ships Adventure and Beagle*. He acquired great popularity with the public for the system of storm-warnings which he established.

**Fitzroy**, a river of Queensland, Australia, formed by the Dawson and Mackenzie Rivers, and flowing into Keppel Bay. The valley of the Fitzroy is very fertile. There is another river of the same name in Western Australia. It flows to King Sound, and is navigable for 100 miles.

**Fiume**, a seaport, belonging to Italy, situated on the Gulf of Quarnero, in the north-eastern extremity of the Adriatic. Its industries embrace paper, tobacco, machinery, chemicals, petroleum, metal goods, and liqueurs. The town came into prominence when the Budapest-Agram (Zagreb) Fiume Railway was built, for the Hungarian Government had spent large sums of money in improving the harbour, and Fiume soon became a busy port and a place of considerable industrial

activity. The harbour is very deep (the largest vessels can lie alongside the town quays), and there are ample dry-docking, repair, and fuelling facilities. Pop. 50,000.

On the outbreak of the European War, Fiume, which belonged to Hungary, had a very mixed population, consisting of 24,800 Italians, 13,000 Croats, 2500 Slovenes, and 6500 Magyars. Thus after the war both Italy and Yugoslavia claimed the port, and the question was submitted to the Supreme Council. Whilst this body was discussing the matter, the patriotic Italian poet, Gabriele D'Annunzio, raised a volunteer army, seized Fiume, declared its annexation to Italy, and set up a provisional Government. He refused to evacuate the city, even after the signing of the Treaty of Rapallo (1920), by which Fiume became an independent state, and he did not yield till the Italian Government declared a blockade. For the next few years Fiume continued its independent existence, but in Jan., 1924, a treaty was signed by which Yugoslavia agreed that it should become Italian.

**Fives**, a ball game of considerable antiquity. The name is almost certainly derived from an essential feature, the use of the five fingers, 'fives' being a slang expression for the hand. Reduced to fundamentals, the game consists in hitting with the palm and fingers, which are protected by a padded leather glove, a small hard ball. The ball must be struck before it has bounced more than once, and it must strike the wall above a certain line. The ball has an india-rubber core; it is bound with fine twine and covered with white leather. There are two forms of the game of fives, known as the Eton and the Rugby game. The original Eton game was played against the chapel wall, with the buttresses constituting side walls; the balustrade of the chapel steps projected into the court. These conditions are represented in a modern 'Eton court' by a paved floor, the front of which is raised 5 inches above the back, forming a step. This type of court has no back wall. Along the left lateral wall at its middle point a projection is erected to act as an obstacle; it is colloquially known as the 'pepper-box'. A game is fifteen points, a point being scored when the ball is struck outside the reach of an opponent. In the Rugby game the size of court varies considerably. The game is much simpli-

fied by the absence of the 'pepper-box'; there is usually, but not invariably, a back wall. The balls are rather smaller than those employed in the Elton game. Scoring is identical in both games.

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**Flag**, a popular name for many monocotyledonous plants with sword-shaped leaves, mostly growing in moist situations; but sometimes particularly appropriated to *Iris pseudacorus*, nat. ord. Iridaceæ; also termed *Flower de lis* or *Flower de lucc*.

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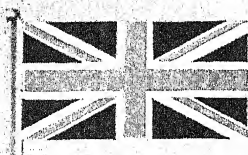
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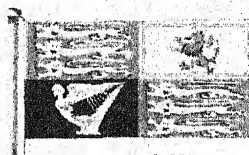
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# FLAGS OF THE NATIONS OF T



UNION FLAG



ROYAL STANDARD



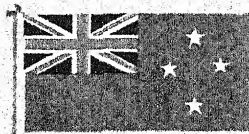
SCOTTISH ROYAL STANDARD



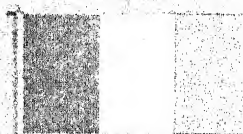
WHITE



AUSTRALIA MERCHANT



NEW ZEALAND MERCHANT



IRISH FREE STATE NATIONAL



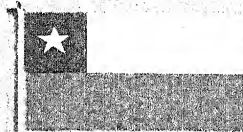
ARGENTINE



BRAZIL NATIONAL



BULGARIA MERCHANT



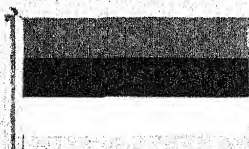
CHILE NATIONAL



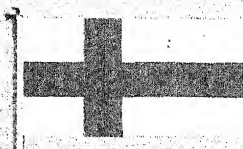
CHINA



EGYPT ENSIGN



ESTONIA NATIONAL



FINLAND MERCHANT



FRANCE



HUNGARY MERCHANT



ITALY MERCHANT



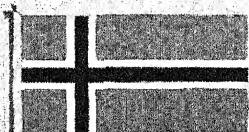
JAPAN MERCHANT



JAPAN



NETHERLANDS NATIONAL



NORWAY MERCHANT



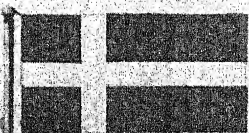
POLAND MERCHANT



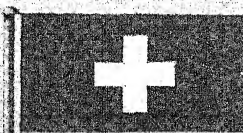
PORTUGAL



SPAIN MERCHANT



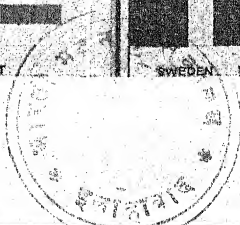
SWEDEN MERCHANT



SWITZERLAND NATIONAL



TURKEY ENSIGN



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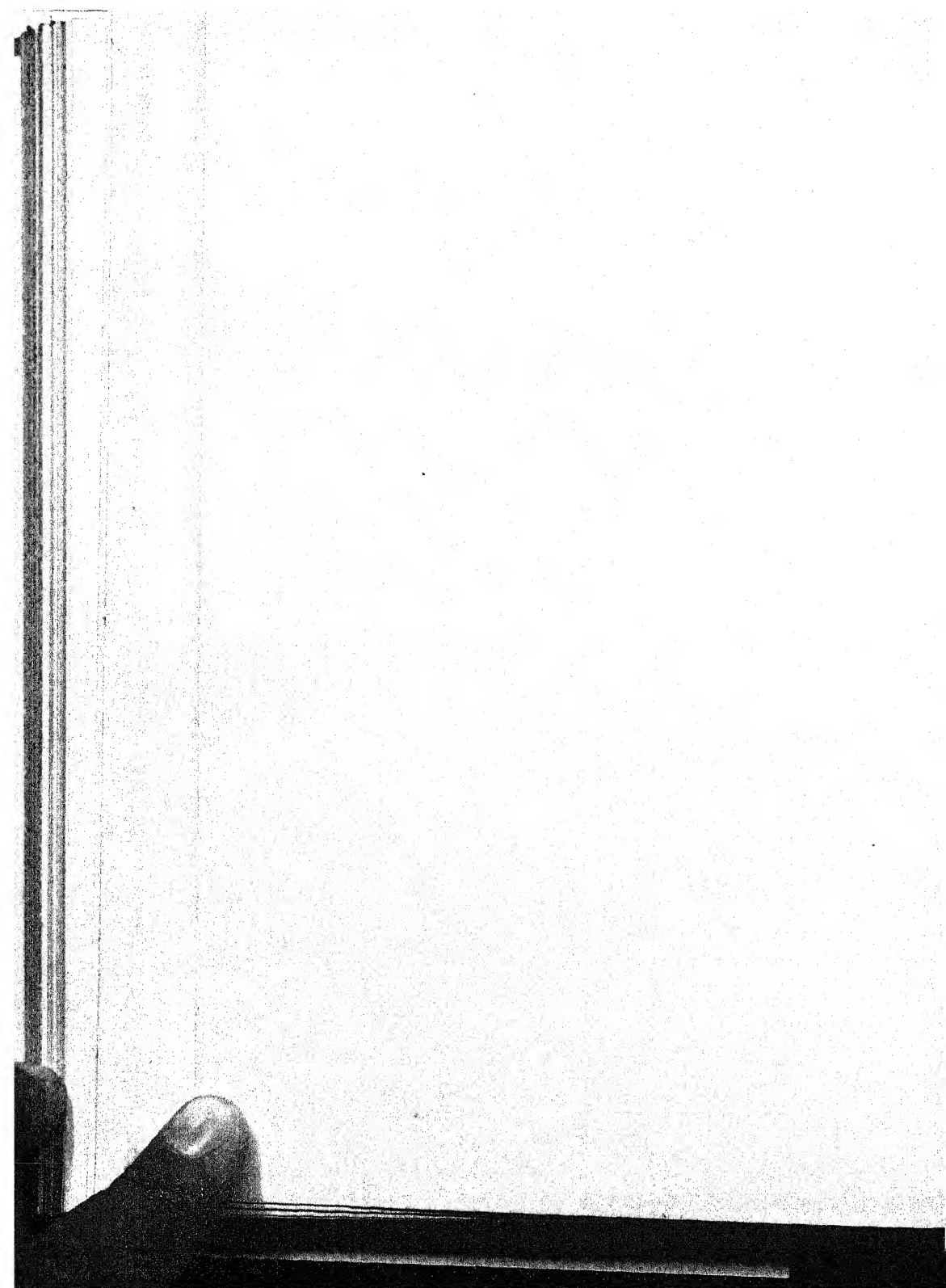
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sprit. The three *ensigns*, red, white, and blue, are a survival from the period prior to 1864, when the fleet consisted of three divisions so named. The *white ensign* is flown by the Royal Navy and the Royal Yacht Squadron; the *red ensign* (the 'red duster') by merchant ships in general; and the *blue ensign* by the Royal Naval Reserve and certain privileged yacht clubs.

During colonial days the flag of the United States was of horizontal stripes, the Union device of Britain appearing in the upper corner. After the Declaration of Independence this flag gave place to one having thirteen stripes, of red and white alternately, as representing the thirteen states of the Union; with thirteen stars in place of the British emblem; all being on a blue field. A new star was added for each new state incorporated in the Union (there are now 48), but the number of stripes has not been altered.

Besides national flags, there are numerous other flags of various kinds and for various purposes; regimental colours, shipping-line house flags, signal flags, pilot flags, personal standards, &c. These are, as a rule, made of bunting, and frequently the device is merely stamped on. Special flags, such as regimental colours, however, are made of silk, and are hand-embroidered. See *Colours, Military*, and consult coloured plates.—BIBLIOGRAPHY: A. MacGeorge, *Flags*; W. J. Gordon, *Flags of the World, Past and Present*; see also *The Admiralty Book of Flags*.

Flahaut de la Billarderie, Auguste Charles Joseph, Comte de (1785–1870), French general and diplomatist. He had a brilliant career under Napoleon I, but on the return of the Bourbons he left France. He returned in 1830, and was Ambassador successively at Berlin, Vienna, and London.

Flambard, Rannulph or Ralph (d. 1128), the chief minister of William Rufus. His flagrant extortions earned the hatred of the people, and his character is painted in the blackest characters by the chroniclers. In 1099 he was made Bishop of Durham; but on the death of William he was committed to the Tower by Henry I. He managed to escape, however, and was subsequently forgiven by Henry and restored to Durham, where he afterwards lived peaceably.

Flamborough Head, a headland on the

east coast of England, in Yorkshire, with a lighthouse.

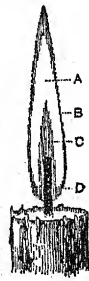
Flamboyant, or Gold-mohur Tree (*Poinciana regia*), a leguminous tree, a native of Madagascar, but cultivated all over the tropics.

Flamboyant, a term designating a style of Gothic architecture in use in France about the same period as the Perpendicular style in England, that is, from the fourteenth to the sixteenth century, having prevailed during the whole of the fifteenth century. It was distinguished by the waving and somewhat flamelike tracery of the windows, panels, &c. (hence the name), and is usually regarded as a decadent variety of the decorated Gothic.

Flame, the blaze from a burning body. The flame of a candle may be divided into three zones: an inner zone containing chiefly unburned gas, another zone containing partially-burned gas, and an outer zone where the gas is completely consumed by combination with the oxygen of the air. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion.

Flamen, among the Romans, the name given to any priest devoted to the service of one particular deity. Originally there were three priests so called: the *Flamen Dialis*, consecrated to Jupiter; *Flamen Martialis*, sacred to Mars; and *Flamen Quirinalis*, who superintended the rites of Quirinus or Romulus. The number was ultimately increased to fifteen.

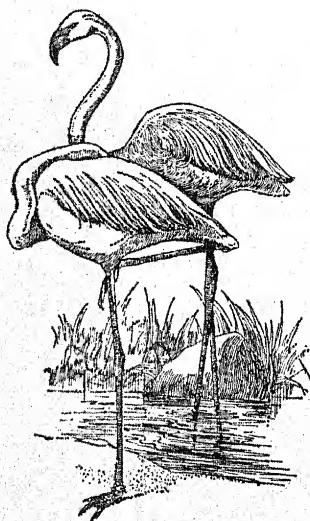
Flame-throwers. The German use of *Flammenwerfer* in conjunction with poison-gas (q.v.) in 1915 forced the Allied armies to adopt retaliatory measures, because although the actual results achieved by the German *flammenwerfer* were surprisingly small, the moral effect of an unknown and terrifying weapon is always considerable until its possibilities and limitations are demonstrated. The Livens apparatus, which was the chief apparatus used on the British side, had a range of 100 yards, and as the jet could be brought



Flame

A, Bright part, of partially consumed gas. B, D, Outer zone, completely consumed gas. C, Inner zone, unburned gas.

as close to the enemy as was required, and could be swung through a large arc, enemy works on a front of 150 yards could be subjected to fire by each flammenwerfer to a depth of 80 yards. The apparatus consisted of a long steel barrel built up in sections clamped together; it was 9 inches internal diameter, and could be extended to any required length and oil capacity (it was 30 feet long on occasion). The tube, or barrel, had a floating piston in it and was filled with oil. At the moment of firing, compressed gas was admitted behind the piston, and the piston forced out the liquid through the jet. The jet remained underground until the moment of firing, and was provided with a steel hood, and this hood had a cutting blade, so that the ground above the jet remained unbroken until the signal came to fire, when the jet was forced up under oil pressure, and the steel hood broke through the last few inches of soil. After firing, the jet sank back and nothing, save a small hole indistinguishable among grass and shell-holes, remained to betray the presence of the apparatus.



Flamingoes (*Phœnicopterus roseus*)

Flamingo, a bird of the genus *Phœnicopterus*, constituting a family *Phœnicopteridæ*, coming half-way between storks

and geese. Its body is smaller than a stork's, but owing to the extreme length of its neck and legs it stands about 6 feet high. The beak is naked, lamellate at the edges, and bent downwards as if broken; the feet are palmated and four-toed. The common flamingo (*P. roseus*) ranges from Central Europe as far as Ceylon. The tongue is fleshy. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding they keep together and employ some to act as sentinels. They breed on marshy ground, building their nests on little hillocks.

Flaminian Way, the principal northern road which led from ancient Rome. It went from Rome to Ariminum (Rimini) on the Adriatic, 222 miles.

Flamininus, Titus Quinctius (c. 228–174 B.C.), Roman general. He terminated the Macedonian War by the defeat of Philip at Cynoscephalæ 197, and proclaimed at the Isthmian games in 196 the independence of Greece.

Flaminius, Gaius (d. 217 B.C.), Roman general. In 217 he was sent against Hannibal into Etruria, and was defeated and killed in the battle of the Trasimene Lake.

Flammarion, Camille (1842–1925), French astronomer. He is one of the most imaginative and popular writers on astronomy. His works include: *Les Mondes imaginaires et les mondes réels* (1864), *La Pluralité des mondes habités* (1862), *Dieu dans la nature* (1866), *Les Merveilles Célestes* (1865), *Voyages Aériens* (1868), *Histoire du ciel* (1872), *L'Atmosphère* (1872), *Les Terres du ciel* (1884), *Le Monde avant la création de l'homme* (1886), *Uranie* (1892), *La Fin du monde* (1893), and *L'Inconnu et les problèmes psychiques* (1900).

Flamsteed, John (1646–1719), the first Astronomer Royal of England. He passed his life at Greenwich, where the Royal Observatory was built for him in 1676. He drew up the first trustworthy catalogue of fixed stars, and supplied the lunar observations by means of which Newton verified his lunar theory. His great work *Historia Cœlestis Britannica* was finished in 1723.

Flanders, a region of Europe, now included in Holland, Belgium, and France, stretching along the North Sea. At one time a separate country, parts of it were



conquered by France and Holland, and the remainder now forms the Belgian provinces of East and West Flanders.—The province of *East Flanders* has an area of 1158 sq. miles. It wholly belongs to the basin of the Schelde, and is very fertile. The principal crops are wheat and flax. Linen, laces, and damask are among the important manufactures. Ghent is the capital. Pop. 1,108,216.—*West Flanders* has an area of 1248 sq. miles. The surface is generally flat; the soil naturally sandy and poor, but well cultivated and fertilized. The most important branch of industry is linen. Great quantities of lace are also made. Bruges is the capital. Flanders has always been 'the cock-pit of Europe', and during the European War (q.v.) it was the scene of some of the fiercest and most prolonged battles. Pop. 852,346.

**Flannan Islands**, or **Seven Hunters**, a group of uninhabited rocky islands in Scotland, in the Outer Hebrides, county of Ross and Cromarty, 21 miles w.n.w. of Lewis. There is a lighthouse on Eilean More.

**Flannel**, an all-wool fabric, woven plain, and at one time largely used for all kinds of underwear. Its only defect was the natural property of shrinking. Wool may now be treated to minimize this defect, but flannel has been largely supplanted by open-work woven fabrics, though still used for children's underwear, sports suits, shirts, and the like.

**Flannelette**, an all-cotton fabric, made to imitate flannel as much as possible in appearance by raising mechanically the soft thick cotton weft to form a nap or fluffy surface on both sides of the fabric. On account of the exuberance of projecting fibres, the fabric is easily set on fire.

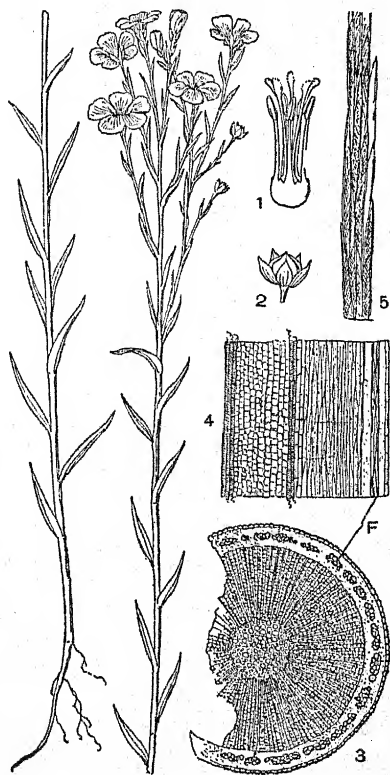
**Flat-fish**, a fish which has its body of a flattened form, and swims on one side. The side facing downwards is pale in colour, while that facing upwards is dark and bears both the eyes. In turbot and brill the eyes are on the *left* side, but they are on the *right* side in plaice, flounder, dab, halibut, and sole.

**Flathead Indians**. See *Indians, American*.

**Flaubert**, Gustave (1821–1880), French novelist. He first became famous in 1857 as the author of *Madame Bovary*, a realistic study of contemporary life. In 1862 he published the historical romance *Salammbô*, depicting the life and manners of ancient

Carthage. The phantasmagoria *La Tentation de Saint Antoine*, and his play *Le Candidat*, appeared in 1874. In 1877 he produced *Trois Contes*, a set of three stories, one of which was *Un Cœur simple*, and was engaged upon another novel, *Bouvard et Pécuchet*, at his death.

**Flavin**, a yellow dye. It has much greater tinctorial power than quercitron bark, from which it is extracted, and yields with aluminium and tin mordants very brilliant colours.



Flax

1, Stamens and pistil. 2, Fruit. 3, Cross-section of stem. 4, Longitudinal section of stem. 5, Flax fibre. F, Flax fibres in situ.

Flax, the common name of the plants of the genus *Linum*, nat. ord. *Linaceae*,

of which the most important of the many species is *Linum Usitatissimum*, cultivated both for linseed and flax fibre. It grows in most temperate and sub-tropical regions, rises to about 3 feet, and has pale-blue flowers. When the plants are required for fibre-producing purposes, the seeds are sown rank, but if linseed and oil are the products desired, a smaller quantity of seed per acre is sown. Plants for flax fibre are pulled up by the roots and packed into crates, which are then submerged in specially prepared ponds or else in slowly running streams. Fermentation begins almost at once, and, in time, the bast layer containing the fibres can be stripped from the stalk. After this operation, technically called *retting*, the stalks are placed outside in stooks to dry. The seed-bolls are then separated from the stems by *rippling*, i.e. the upper ends of the stalks are drawn between the teeth of a coarse comb. From this point the two products pass to different industries. The seed may be used in this state after it has been cleaned and polished, or it may be crushed in order to extract the oil, in which case the residue, called linseed-cake, is used as food for cattle. The stalks from which the fibre is obtained are then subjected to various processes of breaking, separating, and combing, after which the flax fibre, according to quality, is made into either *line* or *tow*. Both types of yarn are subsequently used in the single state as warp and weft in the manufacture of various kinds of linen goods, e.g. sailcloth, tent duck, table, bed, and household linen generally, and for many kinds of ornamental fabrics. Two or more of the above single yarns may be compounded for heavy material. The finest grades of flax are used in the manufacture of lace, cambric, and lawn. In 1913, 115,876 tons of imported fibre were used in the manufacture of linen in Great Britain, of which Russia contributed by far the greatest quantity. The other chief flax-producing countries in Europe at that time were Germany, Austria-Hungary, France, Belgium, and Ireland.

Flax, New Zealand, a fibre obtained from a plant belonging to the order Liliaceæ, the *Phormium tenax*. It is indigenous in New Zealand and Norfolk Island, and grows in great tufts with sword-shaped leaves sometimes 6 feet long. The fibre from the leaves is used by the natives of

New Zealand for making cloth and nets, and quantities of this flax (or hemp) are imported into Britain.

Flaxman, John (1755-1826), English sculptor. Flaxman for some time earned a living by producing designs and models for Wedgwood the potter. In 1787 he went to Italy, where he remained seven years, producing some important sculpture, and winning fame by his designs in outline to illustrate Homer, Dante, Æschylus, and later (1817) Hesiod. His works include public monuments in the round, memorials for churches, and classical and ideal pieces. His best works are his simple monuments in relief. A large collection of casts from the original models is preserved in University College, London.

Flea, blood-sucking insects constituting a sub-order of the two-winged flies (Diptera), termed Aphaniptera because the wings are inconspicuous scales. All the species more or less resemble the common flea (*Pulex irritans*). Eleven species of flea are known to spread the germs of plague, especially one (*Xenopsylla cheopis*) that is parasitic on rats.

Fleabane, a name popularly given to several composite plants from their supposed power of destroying or driving away fleas. The common fleabane is *Pulicaria dysenterica*, found in moist sandy places in the south of England. The blue fleabane is *Erigeron acre*, common on dry banks.

Flea-beetle, the name given to different species of small springing beetles which are destructive to plants, of which the turnip-flea (*Halitica nemorum*) is a well-known example. An allied species (*H. concinna*) is very destructive to hops.

Flecknoe, Richard (c. 1600-1678), English poet and dramatic writer, chiefly memorable for having had his name gibbeted by Dryden in the title of his satire against Shadwell (*Mac Flecknoe*).

Fleet Marriages, irregular marriages performed without licence by needy clergymen in the Fleet Prison, London, from about 1616 till they were suppressed by the Marriage Act of 1754. These clergymen were ready to marry any couples that came before them for a fee proportioned in amount to the circumstances of those who were married.

Fleet Prison, a celebrated prison in London, pulled down in 1845. It stood on the east side of Farringdon Street. Used as a prison for religious martyrs

during the reigns of Mary and Elizabeth, and for political offenders in the reign of Charles I, it became in 1641 a place of confinement for debtors, and served as such down to the period of its demolition.

Fleetwood, a seaport and watering-place in England, in the county of Lancashire, on the Wyre, near its entrance into Lancaster Bay. The harbour is safe and commodious (depth 23 feet), and there is a large coasting trade. The Wyre Docks, with an area of about 25 acres, have been constructed principally for steam trawlers, for which Fleetwood is an important centre. Pop. (1931), 22,983.

**Flemish Language and Literature.** The Flemish or Vlaemisch language is a form of Low German, differing only slightly in pronunciation and orthography from the Dutch. It is spoken by a considerable number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg, and Brabant. A fragment of a prose translation of the *Psalms* upwards of a thousand years old is the oldest extant specimen of the Flemish. The 'father of Flemish poetry', Jakob van Maerlant, wrote several romances dealing with Merlin and the Holy Grail in the thirteenth century; and a version of *Reynard the Fox* belongs to the same period. The fourteenth century was remarkable for the number of romances of chivalry. The translation of the Bible, which is considered the standard for the construction and orthography of the language, was finished in 1618. The eighteenth century produced merely several good writers on philology. The French almost annihilated the native literature, and it did not revive till the revolution of 1830, since which time it has been very vigorous. The leaders in this revival were: Willems, Blommaert, Van Ryswyck, Hendrik Conscience, Van Duyse, Snellaert, Snieders, De Laet, Dedecker, David, and Bormans. Among modern Flemish writers are: Guido Gezelle, Hilda Ram, Cyril Buysse, Baekelmans, Max Rooses, Pol de Mont, and Frans de Potter.—Cf. Delepierre, *Sketch of the History of Flemish Literature*.

**Flensburg**, a seaport in Schleswig-Holstein, at the west end of the fiord of same name, the most important town in Schleswig. The harbour can accommodate vessels drawing 24 feet. The exports are bricks, tiles, oils, spirits, and beer. Pop. 60,941.

**Flers**, a town in France, department of Orne. It carries on cotton-spinning, bleaching, and the manufacture of linen. Pop. 13,810.

**Fleta**, a Latin commentary upon English law, said to have been written in the Fleet Prison in the reign of Edward I. It is impossible to determine the author, unless further evidence is discovered.

**Fletcher**, Andrew, of Saltoun (1655–1716), Scottish political writer. He brought forward measures to secure the religion and liberties of the nation on the death of the queen (Anne), and carried various limitations of the prerogative, forming part of the Act of Security, rendered nugatory by the Scottish union, which he vehemently opposed.

**Fletcher**, Giles (1580–1623), brother of Phineas Fletcher and cousin to the dramatist John Fletcher, English poet. He published *Christ's Victory and Triumph over Death* in 1620.

**Fletcher**, John. See *Beaumont and Fletcher*.

**Fletcher**, Phineas (1584–1650), brother of Giles, English poet. Among his works are: *The Locusts, or Apollyonists*, a satire against the Jesuits; *The Purple Island*; *Piscatory Eclogues*; and *Venus and Anchises* (published 1926).

**Fleury**, André Hercule de (1653–1743), cardinal and Prime Minister of Louis XV. He became tutor to Louis XV, and from 1726 kept the direction of affairs in his own hands. The internal affairs of France prospered under his administration, but his foreign policy was unfortunate.

**Fleury**, Claude (1640–1723), French ecclesiastical historian. His works include: *Histoire du droit français, Mœurs des Israélites, Mœurs des Chrétiens, Institution au droit ecclésiastique, Histoire Ecclésiastique*.

**Flinders**, Matthew (1774–1814), English navigator. He went to Australia in 1795, and discovered Bass Strait in 1798. In 1801 he obtained from the British Government the command of an expedition to explore the Australian coasts, in which he spent two years. In 1814 he published his *Voyage to Terra Australis*.

**Flint**, Robert (1838–1910), Scottish theologian and philosopher. In 1864 he was appointed to the chair of moral philosophy at St. Andrews University, and in 1876 to that of divinity at Edinburgh University. His works include:

*Christ's Kingdom upon Earth* (1865); *Philosophy of History in Europe* (1874); *Theism and Anti-theistic Theories* (1877); and *On Theological, Biblical, and other Subjects* (1905).

Flint, formerly county town of Flintshire, is situated on the estuary of the Dee, 13 miles south-west of Liverpool. In the vicinity are extensive alkali-works and several lead- and coal-mines. There are also large copper-works. The shipping trade of the port is small. Pop. (1931), 7635.

Flint, a city of Michigan, U.S.A., on Flint River. It is a centre for the manufacture of motor vehicles, and has also woollen, flour, and lumber industries. Pop. 91,599.

Flint, minutely crystalline silica of a bluish-grey or greyish-black colour, weathering white or yellowish-brown. It usually occurs in nodules or rounded lumps as a chemical replacement of limestone. It is very hard, strikes fire with steel, and is used as an ingredient in glass and in all fine pottery ware (see *Flint Implements*). In England, flint is most typically seen in the Upper Cretaceous chalk, in which it is formed as a series of concretions arranged in zones parallel with the stratification.

**Flint Implements and Weapons.** According to those who believe that Eoliths were shaped by man, flint working dates back to the Second Interglacial

lithic technique was begun by giving an edge to flaked flint axes by polishing on a grinding-stone. Sir John Lubbock (afterwards Lord Avebury) was the first to apply to the Cultural Ages the terms Palæolithic (Old Stone), during which flint was flaked, and Neolithic (New Stone), during which it was polished. Flint chipping, however, continued throughout the Neolithic Age. The implements which were made of flint were arrow-heads, axe-heads, lance-heads, knives, scrapers, &c. Some backward peoples are still producing flint artifacts. Flint knives are used for ceremonial purposes by other peoples, including the Jews, who circumcise with a flint.

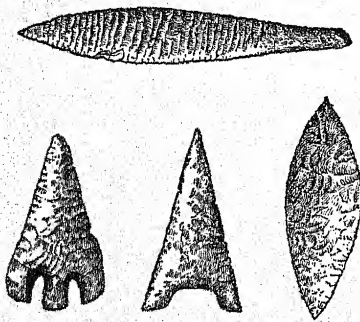
**Flintshire**, a maritime county in North Wales, consisting of two portions separated by Denbighshire; total area, 163,707 acres, of which three-fourths is under crops or in pasture. There are numerous well-watered and fertile valleys, including a portion of the celebrated Vale of Clwyd. The county is rich in minerals, particularly lead, the mines of which are productive. Coal also abounds, and copper is obtained. Pop. (1931), 112,849.

**Flodden**, a village of England, in Northumberland, about 5 miles south-east of Coldstream. Near it was fought the celebrated battle in which James IV of Scotland was defeated by the Earl of Surrey (9th Sept., 1513). The Scots lost about 10,000 men, including the king and a large number of the nobles. Cf. Sir Walter Scott's *Marmion*.

**Flogging** as a punishment existed in the army until 1881, and although not formally abolished in the navy is not inflicted. Whipping of adult males is authorized (1) in the case of incorrigible rogues, (2) for firing at the Sovereign, (3) robbing with violence or robbery or assault when armed, (4) for trying to choke, (5) for certain offences by males against morality. Females may not be whipped.

**Flood**, Henry (1732-1791), Irish orator and politician. He was Vice-Treasurer for Ireland from 1775 to 1781. His speeches and some poetical pieces were published in 1787. His parliamentary encounters with Henry Grattan (q.v.) were remarkable.

**Floors and Floor-space.** Floors are constructed with wooden joists, rolled-steel joists, solid reinforced concrete, or hollow bricks with rolled-steel joists. The loads assumed in calculations of dimensions



Neolithic Flint Weapons

epoch, or an even earlier period. A new technique was introduced into Europe from North Africa by Cro-Magnon man (about 20,000 B.C.) at the beginning of the Upper Palæolithic period. The Neo-



of girders, binders, and joists vary from 70 lb. per square foot in domestic floors to 220 lb. in floors of libraries. Trimmers and trimming joists should be 1 inch greater in breadth and in depth than the common joists, and no trimmer should carry more than six common joists. The best floor-boards come from the White Sea ports, the second quality from Canada and the Baltic. For hard wear maple flooring is the best. In hospitals antiseptic floors are made of teak and terrazzo. Solid floors are finished with wood blocks which are fixed in mastic, and sometimes dowelled. Jointless floors are made of a mixture of sawdust and cement.

*Floor-space* (in square feet).—*Hospitals*, from 90 to 160 per patient; *surgical wards*, 150 to 200; *workhouse infirmaries*, 70 per inmate, special wards 166; *elementary schools*, classrooms 10, assembly hall 6; *secondary schools*, 15 to 18.

Florence, a city of Italy, capital of a province of the same name, 143 miles north-west of Rome. The city is situated on the Arno, which is spanned by the Ponte alle Grazie, the Ponte Vecchio, the Ponte Santa Trinità, the Ponte alla Carraja, and two iron bridges at either end of the city. On either side of the Arno is a spacious quay called the Lung' Arno, a favourite promenade. The city contains numerous piazzas or squares, the most important being the Piazza della Signoria, in which is situated the Palazzo Vecchio, originally the seat of the Government of the republic, and the Loggia dei Lanzi, a fine open arcade. The most remarkable building in Florence is the Duomo, or cathedral of Sta Maria del Fiore, erected between 1298 and 1474, a feature of which is Brunelleschi's magnificent dome which served Michelangelo as a model for St. Peter's at Rome. Close by are the Campanile or bell-tower designed by Giotto, and the Baptistery of San Giovanni with its three magnificent bronze gates. The chief art collection is the Galleria degli Uffizi, which contains specimens of painting and statuary by the greatest masters. Other important art collections are preserved in the churches and palaces. The building formerly known as the *Bargello* is now a national museum, illustrative of the history of Italian culture and art in mediæval and modern times. The Magliabecchian Library, now united with that from the Pitti Palace to form the National

Library, is the great repository of printed books. The manufactures embrace woollens, silks, straw-hats, porcelain, mosaics, and numerous objects in the fine arts.

Florence was probably founded by the Romans in the second century B.C., but it was not till the beginning of the eleventh century that the Florentines became extensive European traders. Their silk and woollen fabrics excelled, and their skill as workers in gold and jewels was unsurpassed. About this time Florence took an active part in the feud between the Guelphs and Ghibellines, and in 1283 a species of republic was constituted. In 1300 the party struggles again burst forth between the same rival families under the new names of the *Whites* and the *Blacks*, in which the Blacks (the Guelphs) were eventually victorious. In the course of these troubles a family of merchants named the Medicis rose to great influence in Florentine politics. One of them, Cosmo, born 1389, was the founder of the political greatness of his house. His grandson, Lorenzo, surnamed *Il Magnifico*, as a statesman, scholar, and patron of art and literature, attained the highest celebrity. On the fall of the republic in the sixteenth century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was created Duke of Florence by Charles V. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterwards Emperor of Germany. From this period the history of Florence merges into that of Tuscany until its amalgamation with the Kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the new Kingdom of Italy. Pop. (including suburbs) (1929), 316,806.—The province has an area of 1497 English sq. miles. The surface is diversified by mountains, valleys, and plains. The climate is mild and healthy, and the soil very fertile. Pop. (1928), 820,615.—BIBLIOGRAPHY: Ruskin, *Mornings in Florence*; E. Hutton, *Literary Landmarks of Florence*; E. V. Lucas, *A Wanderer in Florence*.

Flores, an island in the Dutch East Indies, a dependency of Timor. It lies south of Celebes, from which it is separated by the Flores Sea. It is about 230 miles long, is 5860 sq. miles in area, and has a mountainous surface, with several volcanic peaks. Sandalwood, bees-wax, tortoise-

shell, cotton, and horses are exported. Pop. 250,000.

Flores, the most westerly island of the Azores, about 30 miles long, with a hilly surface. The chief products are wheat, pulse, poultry, and cattle. Pop. about 10,850.

Flores, a department in the south-west of Uruguay, hilly and devoted to agriculture and stock-breeding. The capital is Trinidad. Area, 1744 sq. miles; pop. 26,371.

Florian, Jean Pierre Claris de (1755–1794), French writer. His romances *Galatée*, *Estelle*, *Gonzalve de Cordoue*, *Numa Pompilius*, his fables, and translation of *Don Quixote* are his best works.

Florianopolis, commonly known as *Desterro*, a seaport of Brazil, capital of the state of Santa-Catharina. It exports maize, rice, and tobacco. Pop. 31,000.

Florida, one of the states of the U.S.A., forming the south-eastern extremity of the country, and having the Gulf of Mexico on the south and west, and the Atlantic on the east. It consists partly of a peninsula stretching south for about 400 miles, partly of a long, narrow strip of land running along the Gulf of Mexico. The peninsula is about 90 miles in width, and contains about four-fifths of the total area, which is 58,666 sq. miles. The surface is in general level, rising little above the sea, especially in the southern parts, where it is almost a continuous swamp or marsh. The northern portion is more broken and elevated, but the whole coast is flat. The principal river is the St. John's, flowing northwards through peninsular Florida to the Atlantic. The Appalachian and Suwannee flow into the Gulf of Mexico. There are many lakes throughout the peninsula, the largest being Okeechobee (area, 650 sq. miles). Numerous islands are scattered along the south and west coasts, the most remarkable of which form a long chain called the Florida Keys. The most important of these is Key West, containing the city and naval station of same name. The state produces tropical plants and fruits in great perfection, especially oranges, lemons, limes, shaddock, &c. Tobacco, cotton, sugar, maize, potatoes, rice, and oats are among the other productions. The forests form an important source of wealth. The coasts, rivers, and lakes swarm with fish; tortoises and turtles also abound. The climate in general is excellent,

and the state is much frequented as a winter health-resort for invalids. Tallahassee is the capital and seat of government, but Jacksonville, Tampa, and Pensacola are the largest towns. Florida was first explored in 1512 and 1516 by Ponce de Leon, a Spanish adventurer. It was ceded to Great Britain by Spain in 1763 in exchange for Cuba; reacquired by the Spaniards in 1781, and confirmed to them at the peace of 1783. It was ceded to the United States in 1821, and organized as a territory in 1822. In 1845 it was admitted into the Union, but seceded in 1861, and was not readmitted till 1868. Pop. 968,470, of which 329,487 are negroes. There are 452 Indians, and the reservations have an area of 36 sq. miles.—BIBLIOGRAPHY: S. Lanier, *Florida: its Scenery, Climate, and History*; W. W. Davis, *The Civil War and Reconstruction in Florida*.

Florida, a department of Central Uruguay, a great cattle-breeding region. Area, 4673 sq. miles; pop. 68,849.

Florideæ. See *Red Alge*.

Florid Gothic. See *Tudor Style*.

Florina, a town of Macedonia, in Greece. It was acquired by Greece from Turkey as a result of the Balkan Wars, 1912–1913. Pop. 12,513.

Florio, John (1553–1625), English lexicographer and translator, born in London of Italian parents. His chief works are his *Italian and English Dictionary*, *The World of Words*, and his translation of Montaigne.

Floris, Frans (1520–1570), Flemish painter, whose family name was De Vriendt. His chief works are: *The Fall of the Rebel Angels*, in the Louvre; *The Last Judgment*, in the church of Notre Dame, Brussels; and *The Assumption*, in Antwerp Cathedral.

Florus, Annæus, Roman historian. He lived in the beginning of the second century after Christ, and wrote an epitome of Roman history from the foundation of the city to the first time of closing the temple of Janus, in the reign of Augustus. It is based on Livy.

Flotation of Minerals, a process of mineral concentration in which the valuable portion of the ore is caused to float and thus separate from the worthless mineral portion or gangue. Particles which are not easily wetted tend to float, whilst particles which are easily wetted tend to

sink. If a small needle be carefully placed on the surface of water it will float, whereas a piece of glass of the same size, though lighter, will sink. In mineral separation, it is found that sulphides of the metals, for example copper pyrites, galena, zinc blende, &c., are not easily wetted and thus tend to float, whereas the gangue minerals such as silica, barytes, oxide of iron, &c., are easily wetted and tend to sink. A second action which has to be taken into account is connected with the behaviour of oil. On being mixed with water, oil rises to the surface owing to its lower specific gravity and insolubility in water; it also shows a preference for certain classes of mineral sulphides such as those mentioned above, so that it attaches itself readily to them, while passing the particles of gangue, which are quickly wetted by water, and sink. This property of oil was the basis of a patent, taken out in 1898, for a process in which the ore was pulverized and mixed with water, to which oil was afterwards added. The oil, rising to the surface, carried the valuable sulphide particles with it, leaving the gangue minerals behind in the water. Less than 1 lb. of oil is used per ton of ore treated. Film flotation and froth flotation are modifications of the process. In all cases the material must be very finely divided, and preferably in the state of slime. Very large quantities of ores, &c., amounting to millions of tons per annum, are treated by these methods for the recovery of copper, lead, zinc, and other minerals, including certain quantities of the precious metals.

Flotow, Friedrich Adolphus von (1812–1883), German musical composer. His *Naufrage de la Méduse* was successfully produced at the Renaissance Theatre, Paris, in 1839. This was followed by *L'Esclave de Camoëns* (1843), and *L'Âme en Peine* (1846), performed in London as *Leoline*. *Alessandro Stradella* was first performed at Hamburg in 1844, and his most successful work, *Martha*, at Vienna in 1847. Among his other works are: *Indra* (1853), *La Veuve Grapin* (1859), *L'Ombre* (1869), and *L'Enchanteresse* (1878).

Flotsam, Jetsam, and Ligan, in law. *Flotsam* or *floatsam*, is derelict or shipwrecked goods floating on the sea; *jetsam*, goods thrown overboard; and *ligan*, goods cast overboard which sink by reason of

their weight and to which a buoy is attached so that they may be found again. Persons finding such goods have certain rights of salvage.

Flounder, one of the flat-fishes, family Pleuronectidæ, genus *Pleuronectes*, the common flounder being the *Pleuronectes flesus*. It is found all round the British coast. They feed upon crustacea, worms, and small fishes, and are much used as food. An allied species is native to the Mediterranean.

Flour, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by some process of sifting. The modern flour-mill is a very elaborate structure. Chilled iron or steel rollers have taken the place of the old millstones, and all the processes connected with the cleaning, grinding, separating, sifting, &c., are accomplished automatically, so that the grain is not touched by hand from the time it enters the receiving-bin till it finally emerges as the finished flour. The first part of the process strips off the bran but only lightly crushes the flour. The unfinished product is known as 'semolina' or 'middlings'. The same operation is repeated several times until all the bran is stripped and sifted away, and the 'middlings' are then subjected to several processes of alternate crushing and sifting, until the flour is finally brought to a pure and finished state. The bran has meanwhile been collected, its chief use being for feeding cattle. The best kind of flour is not that which emerges as the result of the first grinding, but that ground from the purified semolina, known as 'patent' flour. Hence the object of the modern 'high-grinding' system is to make as little flour and as much semolina as possible from the first grinding process, whereas under the old 'low-grinding' system the aim was to produce as much flour as possible from one grinding. In consequence of this the hard grain nowadays makes the best flour, whereas formerly it was the soft grain that was in chief demand; and this is one of the reasons why we import such vast quantities of wheat from America, British wheat being comparatively soft. There are big flour-mills at London, Liverpool, Bristol, Leeds, Hull, Glasgow, Edinburgh, Leith, &c., chiefly grinding imported wheat.

As Great Britain has now the wheat

supplies of the world to draw upon, the imports of foreign wheat are very great, and British millers have no lack of raw material, but a great amount of wheat-meal and flour is also imported annually. Thus in 1923 we imported 111,940,000 cwt. of wheat, wheat-meal, and flour. The chief countries supplying the flour are the United States, Canada, and Australia. In 1923 the exports of grain and flour from the United Kingdom amounted to the value of £6,510,000, sent chiefly to Norway, the Canaries, and the Channel Islands.

**Flourens, Gustave** (1838–1871), French Socialist. He published the lectures which he delivered at the Collège de France under the title of *Histoire de l'Homme* and *Science de l'Homme*. He was killed when fighting for the Commune at Paris.

**Flourens, Marie Jean Pierre** (1794–1867), French physician and physiologist. His works include: *Expériences sur le système nerveux*, *Développement des os*, *Anatomie de la peau*, *Mémoires d'anatomie et de physiologie comparées*, and *De l'Instinct et de l'Intelligence des animaux*.

**Flower, Sir William Henry** (1831–1899), English zoologist and comparative anatomist. In 1884 he was appointed director of the Natural History Museum at South Kensington. He was for twenty years president of the Zoological Society, a Fellow of the Royal Society from 1864, and in 1889 he was president of the British Association at their Newcastle-on-Tyne meeting. His works include: *Introduction to the Osteology of the Mammalia* (1870), *Fashion in Deformity* (1881), *The Horse* (1892), and *Essays on Museums and other Subjects connected with Natural History* (1898).

**Flower**, in popular language, the blossom of a plant, consisting chiefly of delicate and gaily-coloured leaves or petals; in botany, the organs of reproduction in a phanerogamous plant (see *Botany*). These organs are surrounded by the corolla and calyx, which together are called the *floral envelope*, or, when they both display rich colouring, the *perianth*. The leaves of the corolla are called *petals*, and those of the calyx *sepals*. Some flowers want the floral envelope, and are called *achlamydeous*; others have the calyx but are without the corolla, and are called *monochlamydeous*. Flowers are generally *bisexual*, but some plants have *unisexual*

flowers; that is, the pistils are in one flower and the stamens in another.

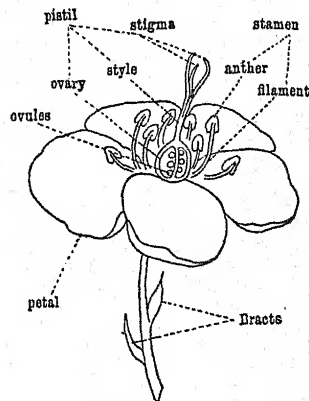


Diagram of Tea-flower  
Ovary cut open (calyx not shown)

**Flowering-fern**, the popular name of *Osmunda regalis*, nat. ord. Osmundaceæ. It grows in boggy places and wet margins of woods. See *Osmunda*.

**Flowering-rush** (*Butōmus umbellatus*), nat. ord. Butomaceæ, a beautiful British plant found in pools and wet ditches, with large leaves so sharp that they sometimes cut the mouths of cattle, whence their generic name *Butōmus* (ox-cutting).

**Fluid**. Matter is found in three different states or phases—solid, liquid, and gaseous. The name fluid is used as equivalent to non-solid, so that both liquids and gases are fluids. Both a liquid and a gas have, per unit mass, a definite volume at given temperature and pressure. A gas, however, fills the whole volume of any closed vessel which contains it, the pressure adjusting itself to the volume and the temperature. A liquid, on the other hand, if placed in a closed vessel, will in general occupy, as liquid, only a portion of the volume of the vessel, but will give off vapour until a certain definite point of equilibrium is reached, depending on the original mass of liquid, the volume of the vessel, and the temperature.

**Flukes, or Fluke-worms**, a name given to certain parasitic animals belonging to the phylum Platyhelminia or Flat-worms, and included in the class Trematoda. The



adult *Distoma hepaticum* exists in large numbers in the livers of sheep, and causes the disease known as 'rot'.

**Fluorescence**, an optical effect in which some bodies become luminous when placed in sunlight or when acted on by other radiations. The effect is brought out in a more striking manner by placing the substances in a dark room in the path of a beam of invisible ultra-violet rays, when these substances become luminous. They have the property of absorbing the short invisible waves and of emitting, in their place, longer waves capable of affecting the eye. The fluorescent light lasts only so long as the body is receiving the stimulating radiation; in the case of paraffin oil, the light is blue, that from uranium glass is green, whilst a solution of chlorophyll gives a dark-red fluorescence. Fluorescence can be excited by the action of radium and of X-rays.—Cf. S. P. Thompson, *Light, Visible and Invisible*.

**Fluorine** (symbol, F; atomic weight, 19), an element which occurs widely distributed in small quantity, always in combination with metals, e.g. fluor-spar ( $\text{CaF}_2$ ), cryolite ( $\text{AlF}_3 \cdot 3\text{NaF}$ ), &c. Owing to the great activity of the element, it is extremely difficult to isolate. It decomposes water, glass, &c., and explodes on mixing with hydrogen. Combined with hydrogen it forms hydrofluoric acid. The salts of this acid (HF) are called *fluorides*.

**Fluor-spar**, **Derbyshire Spar**, or **Fluorite** ( $\text{CaF}_2$ ), fluoride of calcium, a common mineral found in Derbyshire, where the blue-tinted variety is known as *Blue John*. It generally occurs massive, but crystallizes in simple forms of the cubic system—commonly the cube. Pure fluor-spar occurs frequently in limestone and in altered granites. It is sometimes colourless but often tinted, and is made into a great variety of articles, chiefly ornamental. It is used as a flux in metallurgy, and is a source of hydrofluoric acid. Its specific gravity is 3.14, but it is of low hardness (4), being scratchable by apatite.

**Flushing**, a fortified seaport in Holland, province of Zeeland, on the Island of Walcheren, at the mouth of the West Schelde. The two docks have a uniform depth of 24 feet. There are several graving-docks. The principal exports are

oysters, shrimps, and agricultural and dairy produce. There is a regular steamer service between Flushing and Queenborough, in Kent. Pop. 22,419.

**Flute**, a wind musical instrument, consisting of a straight tube having six holes for the fingers, and from one to fourteen keys which open other holes. The sound is produced by blowing with the mouth across an oval aperture at the side of the upper end of the instrument. Its compass is about two and a half octaves, including the chromatic tones. It is usually made in four pieces, and is of box or ebony.

**Flux**, a substance added to a furnace charge, to combine with the gangue minerals and form a fusible slag. If the gangue is siliceous, limestone or iron ore is used; but if it is basic, a siliceous flux is added. The fluxes made use of in assays or chemical experiments consist usually of alkalies and alkaline salts, as borax, cyanide of potassium, carbonate of potassium, carbonate of sodium, common salt. The fluxes used in pottery are chiefly red-lead, borax, carbonates of potassium and sodium, and sand. Soldering fluxes dissolve any oxide which may be formed, the common fluxes being tallow, resin, and zinc chloride.

**Fluxions**, the name of a mathematical method invented by Sir Isaac Newton. This method of analysis is now known as the infinitesimal calculus, but Newton's notation has been replaced by that of Leibnitz, except occasionally in dynamics. The friends of Leibnitz disputed Newton's claim to be the sole discoverer of the calculus, and a long and bitter controversy ensued.—Cf. G. A. Gibson, *The Analyst Controversy* (Proceedings of the Edinburgh Mathematical Society, vol. 17, 1899).

**Fly**, a winged insect of various genera and species, whose distinguishing characteristics are that the wings are transparent and have no cases or covers. By these marks flies are distinguished from beetles, butterflies, and grasshoppers. The true flies or Diptera have only two wings, viz. the anterior pair. In common language, *fly* is the house-fly, of the genus *Musca*. The female lays her eggs in refuse; the larvæ are small white maggots. They change into pupæ without casting their skins, and in from eight to fourteen days the perfect fly emerges. See *Bot-fly*; *Gad-fly*.

**Fly-catcher**, a name originally given

to certain perching birds of the genus *Muscicāpa*, with a bill flattened at the base, almost triangular, notched at the upper mandible, and beset with bristles. Two species are British—the spotted fly-catcher (*M. grisola*) and the pied fly-catcher (*M. atricapilla*), both about the size of a sparrow.

**Flying.** The capacity for aerial flight is confined to the two groups of animals, Insecta and Vertebrata. Two main types of flight may be distinguished, soaring or planing, as seen in the flying-fish, and flapping or beating. Birds have recourse to both methods, but the 'hovering' of a kestrel, tern, kingfisher, or humming-bird is pure flapping. The detailed mechanism of the flight of a bird is not completely known, but there can be little doubt that an important part is played by the highly developed nervous system with its elaborate balancing organs (otocysts) and highly sensitive skin, which enable the bird, especially when soaring, to take advantage of every little upward current or eddy in the air. The normal speed of birds is, in miles per hour: swifts 70-100, ducks 44-59, geese 42-55, falcons 40-48, starlings 38-49, pigeons, 30-36, smaller Passeres 20-37.

**Flying Dutchman**, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill-luck. According to the legend, the captain, a Dutchman named Vanderdecken, swore a profane oath that he would weather the Cape though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in rounding the point. The legend has been made the groundwork of a novel by Marryat (*The Phantom Ship*) and an opera by Wagner (*Der Fliegende Holländer*).

**Flying-fish**, a name common to various fishes which can sustain themselves in the air, but it is usually limited to the species of the genus *Exocoetus*, which belongs to the family Scomberesocidae (mackerel-pikes). It is most common between the tropics. The best-known species are *E. volitans* and *E. caviens* of the Mediterranean. The name is also applied to the flying gurnards (*Dactylopterus*).

**Flying-fox.** See *Fox-bat*.

**Flying-lemur**, a name given to insectivorous mammals, natives of the Indian Archipelago and belonging to the genus

*Galeopithēcus*, which constitutes a sub-order (Dermoptera) of the Insectivora.



Flying-lemur

**Flying-phalanger**, a popular name of the members of a genus of nocturnal marsupials (*Petaurus*) nearly allied to the true phalangers. These animals inhabit New Guinea and Australia, where they are known as 'flying-squirrels'.

**Flying-squid**, the popular name of a genus of cephalopodous molluscs allied to the squids, with the power to leap high out of the water.

**Flying-squirrel** (*Sciuropterus*, *Pteromys*, and *Eupetaurus*), three genera of rodent animals, family Sciuridae (squirrels), which can support themselves in the air and glide for a considerable distance. There are both European and American species.

**Foch, Ferdinand (1851-1929)**, French soldier. He was educated at Metz and at the École Polytechnique, and took part in the Franco-German War. In Oct., 1874, he was gazetted lieutenant in the artillery. Three years later he went through the cavalry school at Saumur, and on leaving it was promoted captain. In 1885 Captain Foch was sent to the École Supérieure de Guerre in Paris. After two years at the war school or staff college,

he was appointed to the staff of a division, till in 1891 he was recalled to Paris as a major on the General Staff. After this he had an interval of regimental duty in command of a horse-artillery battery, and in 1895 he was appointed professor of military history, strategy, and applied tactics at the École Supérieure de Guerre. Here he made his mark. In 1900 Lieutenant-Colonel Foch left the École de Guerre, and, after a period of regimental and staff service, was promoted brigadier-general on the General Staff, and was offered and accepted the post of Director-in-Chief of the École de Guerre. In 1911 Foch was promoted to the rank of general of division, and took over command of the 13th Division at Chaumont. The following year saw him transferred to the command of the 8th Army Corps at Bourges, and in 1913 to that of the 20th Corps at Nancy, forming part of General de Castelnau's Second Army. This was his command when the European War broke out. His brilliant tactics were largely responsible for the Allied victory at the first battle of the Marne. Early in October, Foch was appointed associate to the Commander-in-Chief, to co-ordinate movements of all Allied troops defending the coast, i.e. from the Oise to the sea, unity of command being thus established in some small measure and being made possible by his personality. During 1916 Foch had much to do with the preliminary arrangements for the battle of the Somme. In May, 1917, he became Chief of the Staff vice General Pétain, appointed Commander-in-Chief; in October he visited Italy to discuss with the Italian General Staff the measures necessary to stabilize matters there. At the same time he was President of the Inter-Allied War Council which had been constituted at Versailles. He became Generalissimo of the French, British, Belgian, and American armies on 26th March, 1918; and to him is due the credit of the great counterstroke which saved the situation at the second battle of the Marne, and which was the beginning of the end. The French Government marked their thankful appreciation of his great services by bestowing upon him the dignity and rank of a Marshal of France.—BIBLIOGRAPHY: A. H. Atteridge, *Marshal Ferdinand Foch*; E. G. Marks, *How Foch makes War*.

Focşani, a town of Moldavia, Romania,

90 miles north-east of Bucharest. It is an agricultural centre, and has a good trade in grain. Pop. 25,287.

**Focus**, (1) in optics, a point through which all the rays of a beam of light pass, after their directions have been changed either by reflection at a mirror or refraction by a lens. A focus may be *real*, or *virtual*. (2) In geometry, a point having properties of a special kind in relation to a curve. A conic section, e.g., may be defined as the locus of a point whose distance from a fixed point, called the focus, bears a constant ratio to its distance from a fixed line, called the directrix.

**Fog**, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapour of the atmosphere into minute watery particles, this condensation being caused by a cold current of air, or the contiguity of a cold surface. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day. Moreover, fogs may be produced by accumulation of smoke. This happens particularly when the air near the earth is colder than that above. This condition prevents the rising of the surface air and its warming by mixing with the higher air. The fog also hinders the sun's rays warming the earth, and thus in a calm type of weather such fog may be very persistent.

**Fogazzaro**, Antonio (1842–1911), Italian novelist and poet. His first poetic romance, *Miranda* (1874), was followed in 1876 by *Valsolda*. Fogazzaro then turned to fiction, published *Malombra* (1881), *Daniele Cortis* (1887), and *Il Misterio del Poeta* (1888). His greatest work, however, upon which his fame chiefly rests, is his *Il Santo* (The Saint, 1905). It is the last of his famous trilogy, the first two being *Piccolo Mondo Antico* (1895) and *Piccolo Mondo Moderno* (1901).

**Foggia**, a cathedral town of South Italy, province of Foggia, 79 miles north-east of Naples. The trade is chiefly in corn, for which immense granaries have been formed under the streets. Pop. (1928), 91,975.—The province, which is partly bounded by the Adriatic, has an area of 2683 sq. miles. It possesses rich pastures, and produces saffron and wine. Pop. (1928), 517,155.

**Fogo**, a mountainous island, Cape Verde Archipelago; area, 190 sq. miles.

The island is fertile in the north and practically barren in the south. Coffee, sugar, maize, and fruit are produced. Pop. 16,500.

**Fog-signals**, signals given by means of sound to warn vessels during fogs. Bells, drums, gongs, guns, compressed-air whistles, steam-whistles, and horns are used. In the siren fog-horn, the sound is produced by means of a disc perforated by radial slits made to rotate in front of a fixed disc exactly similar. Steam or air at a high pressure is passed between these openings, and causes a sound of great power which can be heard from 20 to 30 miles out at sea. Fog-signals are also used on railways; they consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it runs over them. In recent times wireless signals have been used for the purpose of determining positions in fogs.

**Föhr**, one of the North Frisian Islands in the North Sea, off the west coast of Schleswig; area, 28 sq. miles; pop. about 4000.

**Foil**, a small sword 83 inches in length, tapering gradually from hilt to point, manufactured as light as possible, and tipped with a leather button to prevent injury. It is essentially a weapon to thrust with and not to cut. It was used in this country for the first time in Elizabeth's reign, and since then it has been regarded as a particularly suitable weapon for duelling. Whilst originally the education of every man of quality and fashion was regarded as incomplete without considerable practice in the use of the foil, the exercise of fencing has fallen into disuse, more so in this country than on the Continent.

**Foix**, Gaston de. See *Gaston*.

**Foleshill**, a town of England, in Warwickshire, manufacturing ribbons. There are coal- and ironstone-mines in the neighbourhood. Pop. (1931), 18,100.

**Foley**, John Henry (1818-1874), Irish sculptor. His works are numerous, and include statues of Selden and Hampden at Westminster; Goldsmith, Burke, and O'Connell in Dublin; Lord Hardinge and Outram in Calcutta; and Lord Clyde in Glasgow.

**Foligno**, a town of Central Italy, province of Perugia. There is a trade in paper, silk, and soap. Pop. (commune), 28,373.

**Folkestone**, a municipal borough, sea-

port, and watering-place, England, county Kent. There is accommodation for vessels of 600 tons, and there is a regular steamship service to Boulogne. Fisheries are important. Pop. (1931), 35,890.

**Folk-lore**. This term refers to the lore (knowledge) of the folk (people) surviving in living tradition, and not acquired from books. It was first used by William J. Thoms, the founder of *Notes and Queries*. Folk-lore has been a subject of serious study since the brothers J. L. K. and W. K. Grimm made collections of *Märchen* (published 1812-1815), and showed that these had not only a psychological but historical value. They adopted the view that Teutonic, Greek, and Indian myths were of Indo-European origin. Mannhardt (1865) paid special attention to the lore associated with the agricultural mode of life surviving among peasants, and found traces of an ancient pagan religious system that had been supplanted by Christianity. Tylor, Lang, and Frazer, strongly influenced by Mannhardt, have emphasized, in their studies of comparative religion, the importance of the 'lower mythology' of folk-lore. W. H. R. Rivers and Elliot Smith have, however, subjected their evolution theory to severe criticism, contending that the resemblances in the beliefs and customs of far-separated peoples are due to direct and indirect cultural contact which took place in ancient times. Laufer, the American Orientalist, has shown that the potter's wheel, which was invented in ancient Egypt, was associated with a complex culture that can be traced in centres of culture in Asia and Europe into which the wheel was introduced. The study of folk-lore, which has become a science, is of great importance in dealing with the development of religious beliefs and symbolism, political institutions, the sciences of medicine, astronomy, and chemistry, the art of story-telling, architecture, painting, sculpture, music, various crafts, &c. Folk-lore may be found, when studied in association with archæology, language, race-types, and artifacts (objects made by man), to throw light on the early history of a country. Some writers regard folk-lore as the floating material from which early mythological systems were framed, and others as the scattered fragments of half-forgotten mythologies. It is possible that both views have in them



the elements of truth. Although stories containing mythological elements are rapidly dying out in folk-memory, many ancient superstitions and ceremonies still linger. In the customs associated with Christmas, New Year's Day, Easter, May Day, Hallowe'en, &c., are some of great antiquity.—BIBLIOGRAPHY: Sir J. G. Frazer, *The Golden Bough*; G. Elliot Smith, *The Migrations of Early Culture*; A. Lang, *Custom and Myth*; Sir G. L. Gomme, *Folk-lore as an Historical Science*.

**Fond du Lac**, a city of the U.S.A., Wisconsin, at the head of Lake Winnebago. The manufactures include ironfounding, carriage and wagon making, tanning, and sawmilling. Pop. 23,427.

**Fondi**, a town of South Italy, near a coast lagoon to which it gives name, province of Caserta. The district around Fondi is fertile and famous for its wine. Pop. 11,378.

**Fonseca**, a gulf of the Pacific Ocean between Honduras, Salvador, and Nicaragua. It is 40 miles long, and there is a volcano on either side of the entrance.

**Font**. In the early days of the Christian Church the vessel needed for the rite of baptism took the form of a tank, admitting the complete immersion of adults. It was usually placed in a special building called a baptistery. By the eighth century the baptism of infants was general, and, the rite having been administered in churches as early as 578, the need for economy of space reduced the size of the vessel and produced the font. The earlier form was that of an unmounted and undecorated tub. For greater convenience the font was presently mounted on legs, at first often five in number, but soon generally combined into a central shaft or pillar. The basin, though sometimes of local stone, was occasionally of marble or alabaster, polished. Its shape was round, square, or octagonal, the last-named form becoming very general in the fifteenth century. Font-covers, often large and highly decorative, originated in the custom of leaving consecrated water in the font, and in the fear of this being taken for employment in unhallowed magic rites.

**Fontainebleau**, a town of France, department of Seine-et-Marne, in the midst of the forest of same name, about 37 miles S.S.E. of Paris. It owes its origin chiefly to the palace. Pop. 14,700. The palace of Fontainebleau occupies the site of a

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fortified château founded by Louis VII in 1162; this was converted into a magnificent palace by Francis I, and much added to by Henry IV, Napoleon I, Louis Philippe, and Napoleon III. The forest, which is about 50 miles in circumference, covers an area of 42,500 acres, affords numerous pleasant walks, and abounds with game.

**Fontenay-le-Comte**, a French town, department of Vendée. It has manufactures of coarse linen and woollen cloths, and is an entrepôt for the Gironde and Charente wines. Pop. 10,379.

**Fontenelle**, Bernard le Bovier de (1657–1757), French author. In 1683 appeared his *Dialogues of the Dead*. His *Discourse on the Plurality of Worlds* (1686) was the first book in which astronomical subjects were discussed in a popular style. Among his other works are the *History of Oracles* and an *Essay on the Geometry of the Infinite*.

**Foochow**, a town of China, capital of the province of Fukien, 125 miles north-east of Amoy. Foochow was one of the five ports thrown open by the treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbour is difficult. Steamers drawing 22 feet can enter the port. Foochow has a large arsenal and dockyard superintended by European officers; it is also a great literary centre. Pop. estimated at 350,000.

**Foods and Food Values**. At the present day the food of any civilized community includes a bewildering assortment of animal and vegetable products, as well as not a few synthetic substances made by chemists. In spite of this illimitable variety and complexity in the materials man uses for food, the essential ingredients are virtually restricted to the three categories, proteins, fats, and carbohydrates, with, of course, a necessary addition of water and certain inorganic salts. To test the value of any food-material the relative amounts of these three classes of substances must first be determined.

The usefulness of any of these substances is measured by its potential energy, by which is meant the amount of energy which can be obtained, in the form of work, heat, &c., by the oxidation of the food-stuffs to the same extent as occurs in the living body, where the materials

supplied to the body as food are in part absorbed and assimilated into the substance of the body and in part rejected (along with the waste products resulting from the bodily metabolism) as the excreta. In order to express in figures the total potential energy of a food-stuff, the term *calories* has been adopted. By burning a weighed quantity of dried food-stuff in oxygen in a calorimeter, the heat-value of any given food can be obtained and expressed in calories. The calorie referred to is what is more precisely called the *large calorie*, and signifies the heat required to raise the temperature of a kilogram of water from 0° C. to 1° C. As illustrations of the value of common articles of food the following examples may be given: cane sugar 4·116, starch 4·191, lean meat 5·656, and butter 9·231, all in calories per grammme.

But there are great differences in the case of different foods between the absolute heat-value (as tested in a calorimeter) and the physiological heat-value (as expressed in the living body of a human being). Some of the food-materials, like the carbohydrates (sugars and starches) and the fats, are completely oxidized in the body and ultimately converted into water and carbonic acid, so that their absolute heat-values are available and become expressed in *work and heat in the body*. But the protein foods (meat and certain parts of vegetable food) do not undergo complete oxidation in the body. There is only a partial oxidation, so that, instead of free nitrogen being given off (as it is when protein is heated in a calorimeter), in the living body the nitrogen is excreted as urea and other relatively complex bodies. Hence it is necessary to estimate the heat-values of such substances, and subtract the figures from the absolute heat-values of proteins, to obtain the physiological heat-value, i.e. the actual usefulness of these foods to the living body.

After making these necessary corrections the average physiological value of the three classes of food-stuffs can be expressed as follows:

- 1 gramme of fat = 9·3 calories.
- 1 gramme of carbohydrate = 4·1 calories.
- 1 gramme of protein = 4·1 calories.

"The average starvation metabolism of a vigorous man at light work and weighing 70 kilograms approximates 2240 calories, or 32 calories per kilogram. It is obvious

that this amount of energy must be contained in the daily food, and a little more to counterbalance the 'specific dynamic' or heat-increasing power of the food-stuffs, if the individual is to be maintained in calorific equilibrium. When an average mixed diet is ingested, the maintenance requirement is between 11·1 and 14·4 per cent above the starvation minimum. This would amount to from 2488 to 2562 calories, or from 35·5 to 36·6 calories per kilogram of body weight" (Lusk).

The required number of calories can be provided by proteins, fats, or carbohydrates; but for several reasons it is important that all three kinds of food-stuffs should be included in the diet, and combined in proper proportions to form a satisfactory ration. A proper ration has been defined by Voit as "a well-tasting mixture of food-stuffs in proper quantity and in such a proportion as will least burden the organism" (Lusk). He gives the following ration of food administered in a digestible form for the use of an average labourer working from eight to ten hours a day: protein, 118 grammes; carbohydrates, 500 grammes; fat, 56 grammes. This represents 3055 calories.

A great deal of discussion has taken place with reference to a proper dietary, and much important work on the subject was done during the European War. The British field-service ration in June, 1916, was as in the table opposite.

	Protein.	Fat.	Carbo- hydrate.
Actual proportion ..	1·0	1·16	3·05
Theoretical requirements	1·0	1·5	3·5

The following figures are given in an official British document:

Calories required per diem			
For sedentary life ..	..	..	2450
" slight muscular work ..	..	..	2700
" light to moderate work ..	..	..	3050
" moderate work ..	..	..	3400
" very hard work ..	..	..	5500

One of the most important advances in the scientific understanding of the problems of nutrition has been the recognition of the fact that a proper diet to maintain the growth and healthy metabolism of the body must contain something more than proteins, fats, carbohydrates, and salts. "There are some substances existing in natural foods, in very minute quantities, which are absolutely essential to the harmonious fulfilment of the life processes"

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	Weight (ounces).	Protein (grammes).	Fat (grammes).	Carbo- hydrate (grammes).	Calorific Value.
Fresh meat (with 20 per cent bone)	9.6	32.24	39.42	—	497
Meat, preserved .. .. .	3.5	25.55	20.04	—	290
Bread .. .. .	15	34.02	2.12	212.7	1031
Biscuit .. .. .	4	18.82	1.67	90.34	403
Cheese .. .. .	2	15.1	18.4	14	233
Butter .. .. .	1	36	23.24	—	217
Condensed milk (1 tin for 12 men)	—	3.31	3.12	20.86	126
Bacon (waste 8.7 per cent)	4	10.85	60.53	—	606
M. and V. ration .. .. .	5.5	18.28	20.86	9.12	304
Vegetables (fresh potato) ..	8	4.08	22	33.34	155
Sugar .. .. .	3	—	—	76.55	313
Jam .. .. .	3	—	—	52.3	214
Mustard .. .. .	3.75	—	—	—	—
Pepper .. .. .	3.75	—	—	—	—
Salt .. .. .	3.75	—	—	—	—
Tea .. .. .	3.75	—	—	—	—
	58.6	162.61	189.62	495.35	4449

(Lusk). Funk gave the name 'vitamins' (generally written 'vitamines') to these substances. Writing in 1906, Professor Gowland Hopkins, of the University of Cambridge, who is one of the pioneers in this far-reaching advance in our knowledge, explained the significance of what he called the 'accessory factors' of diet. "No animal can live on a mixture of pure protein, fat, and carbohydrate, and even when the necessary inorganic material is carefully supplied the animal still cannot flourish. The animal is adjusted to live either on plant tissues or the tissues of other animals, and these contain countless substances other than proteins, carbohydrates, and fats." See *Vitamines*.—Cf. Graham Lusk, *The Elements of the Science of Nutrition* (3rd edition, 1917).

**Food-supply.** Of the four chief manufacturing and commercial countries, Britain, Germany, France, and the United States of America, only the last is self-supporting in respect of essential food-supplies. The other three countries are all more or less dependent upon importation for some essential elements in their food-supply, and this dependence upon other lands is most marked in the case of Britain. Before the European War the United Kingdom imported annually food and drink to the value of no less than £295,000,000 (roughly speaking), which was fully two-fifths of the total value of her whole annual import trade. Her annual import of grain and flour alone was

valued at over £84,000,000, more than half of this representing wheat, wheat-meal, and flour. In the five years 1910-1914 the United Kingdom imported 80 per cent of its wheat and wheat-flour, as well as large quantities of oats, barley, and maize; altogether of the total cereal requirements of the country over 60 per cent was imported during that period. In view of the special importance of the food-supplies in time of war, a Royal Commission was appointed in 1903 "to inquire into the conditions affecting the importation of food and raw material into the United Kingdom in time of war". The Commissioners, who reported in 1905, held that "not only is there no risk of a total cessation of our supplies, but no reasonable probability of serious interference with them, and during a maritime war there will be no material diminution in their volume". These conclusions were confirmed by experience in the European War (1914-1918), as food-stuffs flowed freely into this country from its numerous sources of supply overseas. Submarine warfare and the shortage of tonnage necessitated the passing of the Corn Production Act (1917), securing to farmers minimum prices if they increased the tillage area (increase 1916-1918, 3,000,000 acres), and the establishment of a Food Production Department of the Board of Agriculture. Since the European War the tendency has been to import as much as possible from British overseas possessions,



in the hope that, through time, the Empire will supply all necessary food-stuffs.

**Fools, Feast of**, the name given to festivals regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies. The Feast of Fools was an imitation of the Roman Saturnalia, and, like this, was celebrated in December. The young people, who played the chief parts, chose from among their own number a mock pope, archbishop, bishop, or abbot, and consecrated him, with many ridiculous ceremonies, in the chief church of the place.

**Fool's Parsley**, the popular name of *Æthusa Cynapium*, nat. ord. Umbellifere, a common British weed, growing in cultivated grounds. Its unilateral reflexed floral leaves distinguish it from most plants to which it is allied. It is nauseous, if not poisonous.

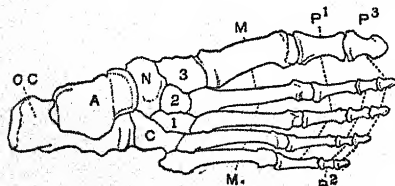
**Foot**, in animals, the lower extremity of the leg. The human foot is composed

palm trees, which furnish dates, wine, and oil.

**Foot-and-mouth Disease**, a highly contagious eczematous affection which attacks the feet and mouths of cattle, manifesting itself by lameness, indisposition to eat, and general febrile symptoms, with ultimately eruptions of small vesicles on the parts affected, and general indisposition of the animal. The disease occasionally spreads to the udder of milch-cattle.

Football in some form or other existed beyond doubt among the Greeks. The game was introduced into this country by the Romans, and for long it maintained a doubtful popularity, principally on account of the roughness of the methods, an objection which induced James I to forbid the heir-apparent to play. No definite rules appear to have been formulated until Rugby schoolboys drew up a code for themselves, and a classical description of the game then played is familiar to readers of *Tom Brown's School-days*. Rugby football, however, was actually a modification of a game of genuine football which had been in existence for centuries. Apart from the school, the game received little support until the middle of the nineteenth century. It was still unattractively rough; actually the system of hacking an opponent was not forbidden until 1877. A want of uniformity proved a great disadvantage until the establishment of the English Union in 1871, followed by the International Board in 1889 to settle any disputes which inevitably arose, since various unions adopted rules of their own not accepted by their opponents.

*Rugby Football* is played between sides of fifteen, and the usual arrangement is to divide them into eight forwards, two half-backs, four three-quarter backs, and one full back. The details of the game and the rules which govern it are far too numerous to describe, but the essential feature is to score goals by kicking the ball over the cross-bar of the opposing side, with the alternative of carrying the ball over the line behind the goal-post and touching it down, thus scoring a 'try', which carries with it the privilege of attempting to kick a goal from a point reached by proceeding directly backwards from the position where the try was scored to an arbitrary distance, at the discretion



Skeleton of the Human Foot

OC, Os calcis or heel-bone. A, Astragalus. N, Navicular or scaphoid. C, Cuboid. 1, 2, and 3, External, middle and internal cuneiform. M, Metatarsal bones. P<sup>1</sup>-P<sup>3</sup>, Three rows of phalanges.

of twenty-six bones, seven of which constitute the tarsus or ankle, which articulates with the leg and corresponds to the carpus or wrist. Five bones form the metatarsus, which corresponds to the metacarpus in the hand, and articulates with the tarsus behind and with the toes in front.

**Foota-jallon**, or **Futa-jallon**, a large district forming the inland portion of French Guinea; area, 40,000 sq. miles; pop. about 600,000. It is extremely mountainous, and is the source of the Rivers Senegal, Gambia, and Grande. Large herds and flocks are pastured in the highlands; and the soil produces in abundance oranges and bananas, and

of the player who attempts the kick. A goal scores five points, and an unconverted try three; the game is won according to the total points—goals and tries—scored. A goal may also be kicked not from a fixed place, but as a 'drop-kick' from any part of the field. Such a goal scores four points. Essential rules of the game are that a player who is not at the time holding the ball may not be molested, and that even when in pos-

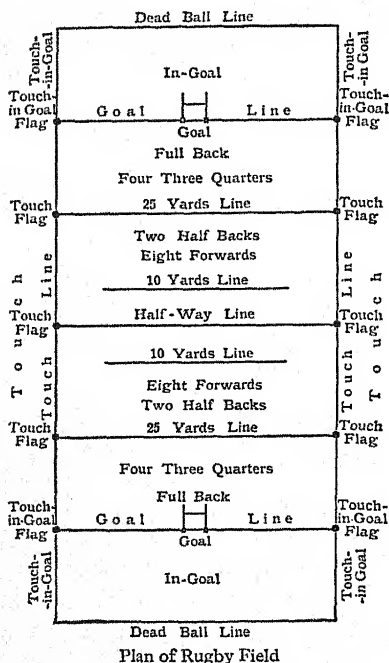
place. This is known as the 'off-side' rule.

The great exponents of the Rugby game are the Scottish schools such as Fettes, Loretto, and Glenalmond, and the high schools of Glasgow and Edinburgh; English public schools, such as Bedford, Rugby, Uppingham, Dulwich, Merchant Taylors, St. Paul's, Oundle, The Leys, and Mill Hill; the hospitals, colleges, and universities throughout the British Isles; a number of clubs in London, such as the London Scottish, Blackheath, Richmond, and The Harlequins, and various Border clubs such as Hawick and Gala. In addition, many towns may be mentioned as the homes of Rugby football, e.g. Leicester, Gloucester, Coventry, Northampton, whilst the vogue in South Wales is greatest of all.

*Association Football.*—On 26th Oct., 1863, the representatives of thirteen London clubs held a meeting and resolved: "That the clubs represented at this meeting now form themselves into an association, to be called the Football Association". Progress was slow, for at the beginning of 1866-1867 only ten clubs were affiliated to the Association. The game was popular in Sheffield, and the Sheffield club proposed a match between London and Sheffield. The game was played on 31st March, 1866, at Battersea Park—the first representative match. The game spread farther afield, and in July, 1867, the Queen's Park Football Club, Glasgow, was formed.

In 1871 the £25 necessary for the purchase of the Challenge Cup (now known popularly as the English Cup) was subscribed by the clubs. Fifteen clubs, including Queen's Park, entered, and this competition was the indirect means of bringing about the first match between England and Scotland on 30th Nov., 1872, at Partick, Glasgow. The Queen's Park arranged the match and supplied the team.

The Scottish Football Association was founded on 18th March, 1873, and the pastime gained ground far more speedily in Scotland than in England. The Scottish Association in 1876-1877 had an entry of 81 clubs for the Scottish Cup, while the parent Association in London had but 37. Scotland began a series of international matches with Wales at Glasgow in 1876, and after that encounter the Welsh Association was brought into being on 24th May, 1876. The Irish Association was organized



session of the ball, although he may be 'tackled' or 'collared' to prevent his proceeding farther or from passing the ball to one of his colleagues, he may not be tripped up. The ball may be 'passed', that is, thrown or kicked to a colleague, but always in a backward direction. And finally, should a player kick the ball forward, it may not be touched by any other player of his side until (1) a player of the other side has touched it, or (2) unless he was behind the player who kicked it at the moment when the kick took

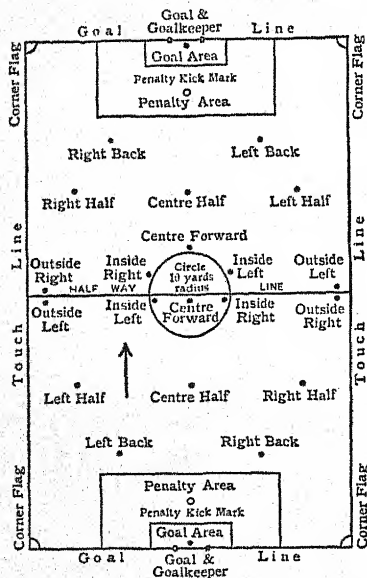
in Nov., 1880. The outcome of the foundation of these governing bodies in the British Isles was the International Board, which first met in London during June, 1887. This consisted of two representatives of each of the four national Associations, who discussed and decided "proposed alterations in the laws of the game, and generally any matters affecting Association football in its international relations". The Board still remains the supreme authority on the laws.

and other countries eventually accepted what was considered inevitable.

In order to obtain money to pay wages, the big clubs in England met in April, 1888, and formed the Football League. This consisted of Preston North End, Wolverhampton Wanderers, Bolton Wanderers, Aston Villa, West Bromwich Albion, Everton, Derby County, Notts County, Burnley, Stoke, Accrington, and Blackburn Rovers. There were only five rules. The first bound the clubs not to cancel League matches, and the third decreed that League matches must be played in full strength.

This departure caused the institution of preliminary qualifying stages for national trophies, and the exemption of powerful clubs so that they could carry out their League programmes. The Football League gradually grew in importance, and in the season of 1925-1926 had 88 clubs, in four sections, playing matches under its management. In 1890 the Scottish Football League was arranged, the clubs then consisting of the Heart of Midlothian (who took the first steps), Glasgow Rangers, Glasgow Celtic, Paisley St. Mirren, Third Lanark, Paisley Abercorn, Dumbarton, Cambuslang, Vale of Leven, and Cowliars. The Queen's Park joined the League in 1900-1901, but preserved their Constitution, thus being the only amateur club associated with either the English or Scottish Leagues. The Irish League was formed in 1890-1891, and the Welsh League in 1921-1922.

The following are a few of the chief rules. The number of players is eleven a side. The object of the game is to score goals by kicking the ball *under* the cross-bar of the opposing side. Only one player on each side, the goalkeeper, may handle the ball, except at a throw-in, after the ball has gone into touch. A free kick is given for handling the ball, for unfair charging, for throwing in the ball improperly, and for kicking the ball when off-side. The off-side rule runs: "When a player plays the ball, any player of the same side who at such moment of playing is nearer to his opponents' goal-line is out of play, and may not touch the ball himself, nor in any way whatever interfere with an opponent, or with the play, until the ball has been again played, unless there are at such moment of playing at least two of his opponents nearer their



*Positions are shown for a kick-off in direction of Arrow*

Plan of Association Field

The spread of the game throughout the industrial centres of England, and the intense rivalry which arose, induced clubs to seek out capable players, without any local attachment, and make them members. Many men left Scotland for English clubs between 1880 and 1884. After great arguments for a year or two, the Football Association, in the summer of 1885, made payments—which they were powerless to prevent—legal, and thus gave official sanction to professionalism. The Scottish Association followed suit in May, 1893,

own goal-line". When the ball is kicked behind his own goal by any player, the other side is given a corner kick, or free kick from the corner of the field. If a player is charged unfairly within an area near his own goal called the *penalty area*, his side is granted a penalty kick, this being a free kick at goal from a point 12 yards away with no interference except from the goalkeeper, and even he must remain in his goal until the ball is kicked. A penalty kick almost invariably means a goal.—BIBLIOGRAPHY: K. R. G. Hunt, *Association Football*; J. E. Raphael, *Modern Rugby Football*; Sir Montague Shearman, W. J. Oakley, G. O. Smith, and Frank Mitchell, *Football* (Badminton Library); *Official Football Guide* (Spalding's Athletic Library); R. H. Barbour, *The Book of School and College Sports*.

Footé, Samuel (1720-1777), English dramatist and actor. In 1747 he opened the theatre in Haymarket with a dramatic piece which he entitled *The Diversions of the Morning*. It consisted of some very humorous imitations of well-known characters, in detached scenes, written by Footé, who always took the leading parts himself. Among his numerous plays, above twenty in number, are *The Liar*, *The Mayor of Garratt*, and *The Devil on Two Sticks*, but none are memorable.

Foot's Cup. See *Sidcup*.

Forain, Jean Louis (1852-1931), French artist. In 1876 he began to contribute his humorous sketches, wherein he castigated contemporary French life, to *La Crevache*, the *Figaro*, *Journal Amusant*, *Vie Parisienne*, and *Le Rire*.

Foraminifera, an order of animals of low type belonging to the class Rhizopoda, phylum Protozoa, furnished with a shell or test, simple or complex, usually perforated by pores (*foramina*), whence the name. They are among the simplest of the protozoa, although at one time, owing to their convoluted shells, they were reckoned among the highly organized molluscs. Foraminifera appear very early in the geological formations. The great formation known as white chalk is largely composed of foraminiferous shells.

Forbes, Archibald (1838-1900), British journalist and war correspondent. He was in the Franco-German War (1870), the Serbian War (1876), the Russo-Turkish War (1877), the Afghan War (1878), and the Zulu War (1880). His

chief publications were: *My Experiences in the Franco-German War*; *Glimpses through the Cannon Smoke*; *Chinese Gordon*; *Souvenirs of Some Continents*; *William I of Germany*; *Barracks, Bivouacs, and Battles*; *Havelock*; *The Afghan Wars*; *Czar and Sultan*; *Colin Campbell*; *Lord Clyde*; *Memories and Studies of War and Peace*; and *Life of Napoleon III*.

Forbes, Duncan, of Culloden (1685-1747), Scottish lawyer and politician. He helped to crush the rebellion of 1715; in 1716 was Advocate-Depute, in 1725 Lord-Avocate, and in 1737 Lord-President of the Court of Session. It was mainly owing to his exertions that the rebellion of 1745 was prevented from spreading more rapidly among the clans. He wrote several religious works: *Thoughts on Religion*, *Reflections on the Sources of Incredulity in Regard to Religion*, and *Letter to a Bishop*.

Forbes, Edward (1815-1854), British naturalist. In 1842 he became professor of botany at King's College, London. In 1853 he was appointed to the chair of natural history in Edinburgh. Among his more important works, which include a great number of valuable papers on zoological, botanical, and literary subjects, are a *History of the Star-fishes* and *History of British Mollusca*.

Forbes, James David (1809-1868), Scottish scientist. In 1833 he was appointed to the chair of natural philosophy in the University of Edinburgh. In 1860 he became principal of the United Colleges of St. Salvator and St. Leonard in the University of St. Andrews. His fame rests chiefly on his study of glaciers. Forbes's theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts.

Forbes - Robertson, Sir Johnston (1853- ), British actor. He made his first appearance on the stage in 1874. Among the plays wherein he obtained great success were: *For the Crown* (1896), *Mice and Men* (1902), *The Light that Failed* (1903), and *The Passing of the Third Floor Back*. Among his Shakespearean rôles are Hamlet, Othello, Shylock, and Macbeth.

Forcados, a seaport of Southern Nigeria, on the west coast, on the south shore of the estuary of the River Forcados. Owing to the presence of a sand-bar at



the entrance to the harbour of Lagos, cargo-vessels proceed to Forcados, where they unload, and the goods are transhipped in smaller vessels, which are able to cross the bar at Lagos. Forcados carries on a large proportion of the trade of Southern Nigeria, and is also a port for Northern Nigeria. Pop. 3189.

**Force**, in a general sense, is any cause of physical action. In the special sense of ordinary dynamics (q.v.), force means that which changes or tends to change the motion of matter. More definitely, according to Newton's second law of motion, a force is measured by the momentum (product of mass and velocity) which it produces in a body in the unit of time.

A force can be represented graphically by a straight line, which indicates its position, direction, and magnitude. Since the force may act either backwards or forwards along the given line, an arrow-head is usually added to make the specification complete. A force may be either a tension or a pressure, in other words, a pull or a push; but the distinction between the two types only becomes important when we take elastic properties into account. See *Electromotive Force*; *Magnetism*, (*The Magnetic Circuit*); also references under *Dynamics*.

**Forced Draught**. Two kinds of artificial draught are in use: the flue gases are either forced up the chimney or they are sucked out of the furnace by fans placed in the path of the gases. The former system, in which air enters the boiler at a pressure higher than that of the atmosphere, is called the *forced-draught system*. It is used exclusively in the navy, and largely in the mercantile marine, but in land practice both the forced-draught and the suction (*induced-draught*) systems are used. They are even combined in the same plant, the combination being called the *balanced-draught system*.

**Forcellini**, Egidio (1688-1768), Italian lexicographer. He and his friend and teacher Pacciolati resolved to publish a complete Latin dictionary. The execution of this great work, occupying nearly forty years of his life, devolved entirely upon Forcellini, though he had the counsel and supervision of Pacciolati. It was published under the title *Ægidii Forcellini totius Latinitatis Lexicon*, &c. (Padua, 1771, 4 vols. folio).

**Ford**, Henry (1863- ), American

automobile manufacturer. In 1903 he founded the Ford Motor Company, which became the largest automobile factory in the world. During the European War Ford at first adopted the policy of bringing about peace as speedily as possible. For that purpose he brought over a party of Americans to Europe. When America entered the war, Ford abandoned his peace policy, and placed his resources at the disposal of his country, producing war material on a very large scale. Since the war he has turned his attention to the production of cheap aeroplanes.

**Ford**, John (1586 - ?1640), English dramatist. Ford's first independent play was *The Lover's Melancholy* (1628). His next play, *The Broken Heart* (printed 1633), is touching if somewhat melodramatic. *Love's Sacrifice* (also printed 1633) has an absurd plot, but much fine writing in it. *'Tis Pity she's a Whore* (printed 1633) is an arresting play, and is most skilfully constructed. *Perkin Warbeck* (printed 1634) is a return to the chronicle history-play which had long been out of fashion. *The Fancies*, *Chaste and Noble*, and *The Lady's Trial* (1638) both mark a distinct decline. After the publication of the latter play Ford drops out of sight. Ford was a careful, deliberate workman, who wrote mainly to please himself. Much of his work is marred by sensationalism. He had no sense of humour, and sinks below all the other Jacobean dramatists in the bad quality of his attempts at comic relief. He was, however, a beautiful writer of blank verse, he had great mastery over some of the technical difficulties of his art, and above all he had a deep knowledge of the passions and contradictory impulses of the human heart.—**BIBLIOGRAPHY**: A. C. Swinburne, *Essays and Studies*; Sir A. W. Ward, *History of English Dramatic Literature*.

**Ford**, Richard (1796-1858), English writer on Spanish subjects. From 1830 to 1834 he lived with his family in Spain. In 1845 appeared the original edition of his excellent *Handbook for Travellers in Spain*, a veritable storehouse of information, rich alike in knowledge and in wit and humour. In subsequent editions this work underwent various changes, and was much reduced in bulk.

**Fordun**, John of (died c. 1384), the father of Scottish history. He wrote the

first five books of his history known as the *Scotichronicon*, or *Chronica Gentis Scotorum* (in Latin), bringing it down to 1153, and part of the sixth, and left materials for its continuation down to his own period. It was resumed about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun were enlarged, and eleven new ones added, bringing the history down to 1437.

**Foreign Exchanges** are the system under which the value of the money of one country in terms of that of others is determined. Published lists, as a rule, give two rates, one at which a banker is prepared to buy, the other at which he will sell, or sometimes one representative 'best' paper, and the other good commercial bills. The chief influences affecting the foreign exchanges are (1) the relative demand for and supply of bills of exchange on the two countries concerned; (2) the comparative purchasing power of the currencies of the countries. When, for example, French merchants have many payments to make in London, and only a limited number of bills in London are in the market, the number of francs given for a pound increases, and the rate moves in favour of London. The supply of and demand for bills of exchange is mainly determined by (a) the balance of imports and exports between the countries; (b) relative rates of discount, which determine whether it is worth while to transfer money from one country to another, thereby making it dearer or cheaper; (c) political or other events which affect confidence, and so encourage or hinder investment in a country. In some countries the currency consists of inconvertible paper, and owing to this and to restrictions on the movement of gold, prices (which express the value of the currency limit in terms of commodities) in each country are largely independent of those in other countries, and with movements in comparative price level come movements in the exchange. Given the possibility of gold movement, the exchange may move so that it is cheaper to send gold one way or the other than to buy bills, and the exchanges are then said to have reached gold or specie point.

**Foreign Legion**, a unit of the French army, consisting of four regiments stationed at Sidi-bel-Abbis and Saïda in

Algeria, and first raised in the time of Louis Philippe. It is, as its name implies, composed of representatives of every nation; the officers, however, are nearly all French. Enlistment is voluntary, and is for a period of five years in the first place, which can be extended by further periods to complete the fifteen years' total service which qualifies for a pension. The Foreign Legion draws its recruits largely from among out-of-work artisans and craftsmen, thanks to which it is a very self-contained corps.

**Foreign Office**, the centre and headquarters of the relations of Great Britain with all foreign powers, is, in its present organization and under its present name, a comparatively modern institution; but its first foundation may perhaps be traced to 1253, when a Secretary to the King was appointed. An assistant secretary seems to have been appointed 180 years later; while in 1539 the post of King's Principal Secretary was shared between two persons of equal standing, having charge respectively of the Northern and Southern 'Departments' or 'Provinces'. The Northern Department included the Low Countries, Germany, Denmark, Sweden, Poland, and Russia; English relations with France, Italy, Switzerland, Spain, Portugal, Turkey, &c., being the concern of the Southern official. The earliest use of the title 'Secretary of State' occurs in 1601. In 1782 the system of Northern and Southern Departments was abandoned, the first Secretary of State for Foreign Affairs as a whole being appointed in the person of Charles James Fox. The Secretary of State for Foreign Affairs receives a salary of £5000, and invariably occupies a seat in the Cabinet. He is assisted by a parliamentary under-secretary, a permanent under-secretary, and three assistant under-secretaries, legal adviser, and large staff of clerks.

**Foreign Trade** is the commercial exchange, between different states, of goods and services. Exports are those goods which are sent out of the country, and imports those which are received, while re-exports are goods which have been imported, but are exported without any material change beyond repacking. Foreign trade has always existed in some degree or other, especially in the Age of Discoveries, but it was not until the industrial revolution revealed the possibilities of

large-scale production that men realized that exchange between different countries might be greatly to the advantage of both. When the invention of steamships and railways followed the industrial revolution, and made possible the systematic opening up of new territories and the establishment of regular and speedy communication all over the globe, the great age of international trade began. The growth of British foreign trade is sufficiently brought out by the following figures of trade to and from the United Kingdom:

## BRITISH FOREIGN TRADE

(in millions)

	Imports.	Exports.	Re-exports.
	£	£	£
1801 ..	31.8	24.9	10.3
1911 ..	522	278	65
1913 ..	768.7	525.3	109.6

The European War of 1914-1918 cut across the lines of trade which had developed during the nineteenth century, and the reconstruction of international trade was one of the most serious problems of the post-war period. The figures of trade returns, owing to the great fall in the value of the money in which they are stated, should only be compared with pre-war returns after full allowance has been made for changes in value. British overseas trade in 1929 was as follows:

Imports	£1,221,591,062
Exports	£729,554,967
Re-exports	£109,741,759.

A feature of foreign trade which has always commanded much attention is the relation between the values of imports and exports, the difference between these two being generally known as the *Balance of Trade*. It is now realized that money in all its forms is only the denominator in international trade, and that unless a country is piling up debts or credits abroad its imports and exports must balance, when all the items are taken into account. The apparent difference in any case is due to the absence of certain items, generally called 'invisible imports or exports', from the returns of trade, in which account is only taken of material commodities. The invisible items fall under two headings: services, and payment of interest or capital. Among proceeds of services the most important are the earnings of shipping and of insurance and financial businesses, which are re-

mitted to the country rendering them in bills, with the proceeds of which goods are bought, while in some instances the expenditure of foreign tourists is a large item. In the other case a country investing capital abroad sends goods abroad against a promise to pay interest or dividends as these may accrue; the goods exported appear in the return, while the consideration for which they are sent is an 'invisible import'. Later, when a country has invested large amounts of capital abroad, it receives interest on these sums in the form of goods. The United Kingdom has long had a large balance of imports over total exports, but the 'invisible exports' are in reality greater than the adverse balance of trade, leaving a true balance of exports over imports which is accounted for by investments of British capital abroad, or by repayments of debt owed by Great Britain abroad, during the year in question. See *Commerce*.

**Foreland, North and South**, two headlands in England on the coast of Kent, between which are the Downs and Goodwin Sands. The former, on the north-east coast, 2½ miles south-east of Margate, has a lighthouse 185 feet high, and is also a wireless station. The latter, on the south-east coast, 3 miles north-east of Dover, has two lighthouses with fixed lights, 372 and 275 feet above high water.

**Forest-fly**, a name popularly applied to a family (*Hippoboscidae*) of two-winged flies parasitic on birds and quadrupeds, but more correctly used to describe a species (*Hippobosca equina*) infesting horses and cattle. The sheep 'tick' and the bee-louse are wingless.

**Forest Hill**, a suburb of London (south-east), 1 mile north of Sydenham, in the metropolitan borough of Lewisham.

**Forestry**, the science of the right use and preservation of wooded areas; or the science and art of establishing and maintaining forests, and of managing them to the best advantage. Forests are of the utmost importance to a country, not only from the direct value of their timber and other produce, but also from the equilibrium in temperature and humidity which they tend to produce where they exist, regulating, as they do, the steady flow of water in springs and rivers, and correspondingly reducing the violence

of floods, and preventing denudation of the earth and silting up of streams. Germany was the first country to reduce forestry (as distinguished from mere arboriculture) to a science. France, Norway, Sweden, Denmark, and Italy are not far behind Germany in this important respect, but Great Britain is very backward. Forestry, however, has been taught for years in connexion with the Indian Forest Service, first at Cooper's Hill College, and from 1903 at Oxford, and elementary instruction in the subject has been given at Cambridge, Edinburgh, Glasgow, Aberdeen, Dublin, Newcastle, Bangor, Wye, and the Royal Agricultural College at Cirencester (until its closure in 1915). In British India, a system of Government forest administration has been developed with astonishing success. The only considerable timber-exporting countries in the world are Russia, Sweden, Norway, and Canada, and the first and last have still forests of enormous value. In the United States the forest wealth has been vastly decreased, yet the States have still 63 million acres of forest. In Britain, since the European War, a Government Forestry Authority has been created, and afforestation has been commenced in several areas.

In forming a new forest it is generally advisable to plant densely (about 6000 or even more per acre). Mixed growths are generally preferable to the cultivation of one kind of tree only. Very often the planting of seedlings, from two to three years old, will be found more profitable in the long run than the sowing of seeds, though the latter is cheaper at the beginning. Most trees thrive best in a moist atmosphere, provided the air is not stagnant. The demand on light varies considerably. All trees like a fresh soil, where the natural drainage is good. The first operation in planting is to fence against ground game. Draining may be necessary, and the surface vegetation, if of a coarse nature, should be cut or burnt. Woods may be established either *artificially* by sowing and planting, or *naturally* by *natural regeneration*. The commonest method is by planting. Trees may be planted at any time from October to April, provided the weather conditions are suitable. There are two main methods of planting: (1) *notching*, or placing the plants under raised pieces of turf; and (2) putting the young trees in small pits,

the latter being a more expensive but a better system. Natural regeneration of woods is their establishment by the fall of seed from adjacent mature woods, and though such a method may take several years, the resulting timber is often the finest. During the early life of a wood, gaps caused by failures have to be filled up, and the young plantations must be kept clean. Thinnings should be light and frequent rather than seldom and heavy, and towards the end of a wood's rotation thinnings may be heavier, so as to allow the best trees that remain full scope for development. Rotations differ for the various species, and may vary from sixty to ninety years in the case of conifers, to nearly two hundred years for oak.—BIBLIOGRAPHY: A. C. Forbes, *The Development of British Forestry*; J. Nisbet, *The Elements of British Forestry*; Sir W. Schlich, *Manual of Forestry*; F. F. Moon and N. C. Brown, *Elements of Forestry*; W. H. Whellens, *Forestry Work*.

Forfar, now Angus, a county on the east of Scotland, bounded by Aberdeen, Kincardine, Perth, the Firth of Tay, and the North Sea; area, 559,087 acres. The surface is covered in the west and north-west by a portion of the Grampians, and in the south by part of the Sidlaw Hills. Between the Grampians and the Sidlaw Hills lies part of the Valley of Strathmore, and between the Sidlaw Hills and the Tay is the level but rich and highly cultivated tract of which the Carse of Gowrie forms a part. The chief rivers are the North Esk and the South Esk. Nearly half the area is under crops, and cattle-rearing is extensively carried on. The manufacture of linens or jute goods is carried on in all the towns (Dundee, Arbroath, Forfar, Brechin, Montrose, &c.), but has its central locality at Dundee. Sandstone flags are quarried in the Arbroath district. Pop. (1931), 270,190.

Forfar, the county town of county Angus, is a royal burgh, 13 miles north by east of Dundee. The staple manufacture is linen, especially of the coarser varieties, there being several large factories, in connexion with which are bleach-works. Pop. (1931), 9660.

Forgery, at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or the making, *malò animo*, of any written instrument for the purpose of fraud and



deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument; also, the counterfeiting of a seal. Capital punishment for forgery was abolished by Acts of 1832 and 1861. The punishment now varies from penal servitude for life, or not more than fourteen or seven years, to imprisonment for not more than two years. The law on the subject has been consolidated by the Forgery Act, 1913.

**Forget-me-not**, the name of *Myosotis palustris*, nat. ord. Boraginaceae, a common British plant growing generally in damp or wet places. Scorpion-grass is also a name for it and others of its genus. Its flowers are bright blue with a yellow eye.

**Forging** comprises the operations used in changing the shape of metal, generally iron and steel, by striking it with a hammer. The object produced is also called a forging. If produced by a hammer worked by hand or by a steam-hammer, the process is known as hammer-forging. Drop-forging consists in forging a suitable piece of metal between prepared dies, the lower part of the die being fitted to the anvil, and the upper part to the hammer itself and moving up and down with it. The various processes included in the operations of forging are *swaging*, which consists in the reduction from a larger to a smaller section; *upsetting*, which is an enlargement of a smaller to a larger section; *bending* to any angle or curvature; *welding*, or uniting of pieces of metal to one another whilst in a plastic condition.

**Forlì**, a town of North Italy, capital of a province of the same name, 38 miles south-east of Bologna. It has manufactures of silk and woollen stuffs, and a considerable trade. Pop. (1928), 57,505.—The province has an area of 1122 sq. miles, and a pop. (1928) of 416,290.

**Formaldehyde**, a gaseous organic compound ( $\text{H}\cdot\text{CHO}$ ), homologous with common aldehyde. The derivative *formamine* is used in medicine as an internal antiseptic. See *Formalin*; *Photosynthesis*.

**Formalin**, a commercial product containing about 40 per cent of formaldehyde in solution in water. Formalin is a pungent-smelling liquid which acts as a reducing agent. It is used industrially as an antiseptic and disinfectant, in the coal-tar industry, in tanning, in waterproofing of fabrics, and for pharmaceutical purposes.

**Formentera**, one of the Balearic Islands, about 12 miles long and 8 miles broad, hilly, woody, and but little cultivated. Pop. 2050.

**Formica**. See *Ant*.

**Formic Acid** ( $\text{CH}_2\text{O}_2$ ), an acid prepared from a mixture of glycerine and crystallized oxalic acid. It is contained in human sweat, in the common nettle, and in certain insects, such as ants.

**Formosa**, or **Taiwan**, a Japanese island in the Chinese Sea, separated from China by a strait about 80 miles wide; length about 250 miles; area, 13,839 sq. miles. A range of mountains (rising to 14,000 feet) divides it into a western and an eastern part, the former of which (mostly a plain) is occupied by numbers of immigrant Chinese and Japanese, and is highly cultivated, producing in abundance rice, sugar, tea, pepper, camphor, oranges, and bananas. In the mountainous parts are wild tribes of Malayan race. Northern Formosa is liable to earthquakes. Railways have been and are being constructed, and several ports opened to European commerce, chiefly Taihoku (the capital), Tai-nan, Tamsui, Keelung, and Takow; and the trade since then has greatly increased. The chief exports are tea, camphor, sugar, and rice. Formosa was ceded to Japan by China in 1895. Pop. (1925), 3,994,236.

**Formosa**, a West African island, one of the Bissagos (q.v.).

**Formosa**, a territory of the Argentine Republic, lying between the Rivers Pilcomayo and Bermejo. The chief products are cattle, tobacco, timber, and sugar. Area, 41,402 sq. miles; pop. 21,880.

**Forres**, a royal burgh of Scotland, county of Moray. Forres Castle was the residence of the early Scottish kings (cf. *Macbeth*). Pop. (1931), 4169.

**Forrest**, John, first Baron (1847–1918), Australian explorer and statesman. He entered the Survey Department in 1865, and in 1869 commanded the expedition sent into the interior in search of Leichhardt. He was subsequently at the head of an exploring expedition which penetrated 2000 miles from Champion Bay through the middle of Australia. He was the first Premier and Treasurer of Western Australia under responsible government (1890–1901), resigning office to become Minister of Defence in the first Federal Cabinet (1901–1903). He was subsequently

Minister for Home Affairs (1903-1904), and several times Commonwealth Treasurer.

**Forst**, a town of Prussia, on the Neisse, 15 miles east by south of Cottbus, with important cloth manufactures and tanneries. Pop. 33,875.

**Forster**, John (1812-1876), English biographer and critic. He became editor of *The Daily News* in 1846 and shortly afterwards of *The Examiner*. In 1848 he published his *Life of Goldsmith*. In 1856 he retired from the editorship of *The Examiner*, having been appointed the year previous secretary to the Lunacy Commission. He also published biographies of Landor and Dickens, but died before completing his *Life of Swift*.

**Forster**, William Edward (1818-1886), English statesman. He was returned to Parliament for Bradford in 1861; became successively Under-Secretary for the Colonies (1865), vice-president of the Education Committee (1868), and a member of the Cabinet (1870). He had charge of the Education Bill of 1870 and the Ballot Bill of 1872. In 1880 he accepted the post of Chief Secretary for Ireland. The suppression of the Land League and the arrest of Parnell and the more violent agitators were carried out by him.

**Forsyth**, Andrew Russell (1858- ), British mathematician. He was Sadleirian professor at Cambridge (1895-1910) and professor at the Imperial College (1913-1923). Among his works are: *Differential Equations*, *Theory of Differential Equations*, *Theory of Functions*, and *Differential Geometry*.

**Fortaleza**. See *Ceara*.

**Fort Augustus**, a village of Scotland, county of Inverness, on the Caledonian Canal. It now forms the site of a Roman Catholic abbey and college. Pop. 791.

**Fort de France**, a seaport, French West Indies, Island of Martinique, of which it is the capital. It has a fine harbour and strong fortifications. The exports, mainly rum, sugar, and cocoa, all go to France. Pop. 26,399.

**Forteviot**, a village in Scotland, Perthshire, where was the ancient capital of the Pietish kingdom of Fortrenn. Pop. 467.

**Fort George**, a fortress of Scotland, in the county of Inverness, at the extremity of a low point of land projecting into the Moray Firth. It was built after the rebellion of 1745.

**Forth**, a river of Central Scotland, formed in Perthshire by the junction of two streams, the Duchray and the Dhu, about 1 mile west of Aberfoyle. In its lower reaches are the winding curves known as the *Links of Forth*. The river expands into the *Firth of Forth*, the chief ports of which are Leith, Granton, Bo'ness, and Grangemouth. The Forth is navigable for small vessels to Alloa. Its length is 68 miles to Kincardine where the firth begins. From Kincardine to the sea is 48 miles. It is a good salmon stream. There are several islands in the estuary. The Isle of May and Inchkeith have light-houses. The firth is crossed at Queensferry by a remarkable bridge. See *Bridge*.

**Fortrose**, a seaport and royal burgh of Scotland, Ross and Cromarty, on the Moray Firth. The harbour admits vessels drawing 9 feet. Pop. (1931), 875.

**Fort St. George**, the old citadel of Madras, and the earliest British settlement in India (1639).

**Fort Scott**, a town in the east of Kansas, U.S.A., an important railway centre. Pop. 10,463.

**Fort Smith**, a town of the U.S.A., in Arkansas, on the southern bank of the Arkansas River. It is the centre of an agricultural region, and coal and natural gas are found in the vicinity. It trades in cotton, coal, and live-stock, and has various manufactures. Pop. 28,870.

**Fortunatus**, the hero of an old popular legend. He obtained a wishing-cap and inexhaustible purse of gold, which finally ruined him and his sons. The first printed edition of the story appeared in Germany in 1509. Thomas Dekker's play *The Pleasant Comedie of Old Fortunatus* appeared in 1600.

**Fortunatus**, Venantius Honorius Clementianus (530-609), Latin poet; Bishop of Poitiers in 597. His works were numerous, but he is remembered only by his hymns, one of which is well known in the modern version of J. M. Neale (*The royal banners forward go*).

**Fortune**, Robert (1813-1880), Scottish botanist and traveller. He visited China between 1843 and 1846 on the Horticultural Society's behalf. In 1851 he introduced the Chinese tea-plant into the North-Western Provinces of India. His works include: *Three Years' Wanderings in the Northern Provinces of China* (1847) and *A Residence among the Chinese* (1857).

**Fortuny**, Mariano (1838–1874), Spanish painter. Amongst the best known of his paintings, which are mostly genre subjects from Southern and Oriental life, are: *A Spanish Marriage*, *A Fantasia at Morocco*, *The Academicians at Arcadia*, and *The Seashore at Portici*. They are marked by great facility and brilliant colour, but are somewhat superficial.

**Fort Wayne**, a city of Indiana, U.S.A., situated at the junction of the St. Mary's and St. Joseph's Rivers, which here unite to form the Maumee. It has railroad and machine works, flour-mills, foundries, and chemical factories. Pop. 86,549.

**Fort William**, a burgh of Scotland, county of Inverness, at the foot of Ben Nevis, near the south end of the Caledonian Canal. At Fort William is one end of the tunnel through Ben Nevis in connexion with the Lochaber hydro-electric scheme. Pop. (1931), 2527.

**Fort William**, a port, Ontario, Canada, head of the lake navigation on Lake Superior, and lake terminus of the C.P.R. and C.N.R. It has an enormous transit trade, and is the greatest coal-handling centre in Canada. There are flour-, lumber-, and paper-mills, and numerous other industries. Pop. 22,000.

**Fort Worth**, a city in Texas, U.S.A., on the south bank of the Trinity River. The many railways which enter the city from all sides give it a great importance; and there are numerous manufactures and industries, of which the woollen and flour are the chief. There are stock-yards and canning establishments. Pop. 106,482.

**Forum**, among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, by far the most celebrated being the great Roman forum (*Forum Romanum*) between Mount Palatine and the Capitoline Hill. This place, once adorned with the most beautiful statues and buildings, had become almost a waste known as the *Campo Vaccino*, or cattle-field, but since the end of last century the Government has made clearances and excavations and taken charge of the valuable relics which are still left.

**Foscari**, Francesco (1372–1457), Doge of Venice. The whole period in which he governed the republic was one of war and tumult. Three of his sons died in the

service of the republic, and the fourth, Jacopo, being accused of receiving bribes from foreign princes, was condemned to torture and exiled to Crete, where he died. On the story of Jacopo Foscari is founded Byron's tragedy of *The Two Foscari* and Verdi's opera *I due Foscari*.

**Foscolo**, Ugo (1778–1827), Italian poet and prose writer. His early works were a tragedy, *Il Tieste*, and a romance called *Ultime Lettere di Jacopo Ortis* (Last Letters of Jacopo Ortis). In 1805 he wrote *I Sepolcri*, one of the finest of his poems. In 1812 he produced his tragedy of *Ajax*, and soon after that of *Ricciarda*. Besides the works already mentioned, his critical writings, *Essays on Petrarch* and *Discourses on the Texts of Dante and of Machiavelli's Il Principe*, are well known.

**Fossano**, a town in North Italy, on the Stura, 13 miles north-east of Cuneo. It has manufactures of paper and silk. Pop. 18,175.

**Fossils**, in geology, any trace of an organism, animal or vegetable, found in rocks older than those forming at the present day. In former times fossils were often known as 'petrifications'.

Fossils in the vast majority of cases are shells, or bones, or the carbonized relics of vegetation, to which an organic origin must be assigned. The preservation of vegetable fossils has depended almost entirely on their becoming entombed in water, and the marine fauna of all geological periods is far better known than that of the land. Lakes, like those of the Devonian period, may occasionally assist the record; but terrestrial remains are liable to be broken up and scattered long before they can be covered by a protective mantle of mud or sand. Clays, owing to their impermeable nature, preserve fossils almost unchanged. The organic matter disappears; the wealth of colour passes from the shells; but even the most delicate foraminifera escape abrasion or solution. In sandstones or limestones the aragonite deposited to form the hard parts of corals and many shell-fish is soon replaced by calcite, but the shell-substance of fossils may be replaced by chalcedonic silica (flint), iron carbonate (siderite), or even iron disulphide (pyrite or marcasite). Fossil bones tend to lose their calcium carbonate and to increase their percentage of calcium phosphate and fluorine. The teeth of sharks are sufficiently abundant

in some deposits to furnish an agricultural fertilizer.

The bones of land-animals are sometimes preserved, as at the farm of Pikermi in Attica, by having been swept into the flood-deposits of streams; but whole vertebrate skeletons, other than those of fishes, are rarely found. Wonderful predictions have sometimes been made as to the nature of certain fossils from very scanty relics. Predictions from European specimens have in many cases been confirmed by the discovery of almost complete skeletons, or of mingled material from which a typical skeleton can be assembled, in the dry deposits of the Central United States.

At Solnhofen and Eichstätt, in Bavaria, a flaggy limestone of very delicate grain, the famous lithographic stone, has preserved a number of fossils that serve to show how imperfect the palæontological record is under more ordinary rock-conditions. The earliest-known bird occurs in these strata, which are of Upper Jurassic Age, the impressions of its feathers being well exhibited. The forms of soft-bodied animals, such as jelly-fish, and the membrane of the wings of flying reptiles are similarly recorded in these limestones, and in Württemberg the whole form of Ichthyosaurus, showing unexpected fins, has been preserved as a mould around the skeleton. The poverty of the evidence of earlier animals has been explained by the suggestion that they were incapable of utilizing salts of calcium for the construction of hard parts; or that salts of calcium were not available in the seas in a dissolved form. The presence of lacustrine fossils in arid regions may merely indicate an epoch of desiccation; the presence of marine fossils beyond the reach of the existing seas indicates a shrinkage of the oceans or an elevation of the sea-floor into land. The nature of the fossils, when compared with existing organisms, records in some measure the conditions of depth and climate under which the strata were laid down. See *Plate Palæontology*. For Bibliography see *Geology*.

Foster, Myles Birket (1825-1899), English artist. He achieved a high reputation as an illustrator of books and periodicals, and illustrated the works of Goldsmith, Scott, Longfellow, Beattie, &c. He afterwards devoted himself to water-colour

painting of landscapes and rustic subjects.

Foucault, Jean Bernard Léon (1819-1868), French physicist. His name is especially connected with a celebrated pendulum experiment employed as a method of showing the rotation of the earth on its axis, by observing a vibrating pendulum. He also rendered services to optics, electric lighting, and photography.

Fouché, Joseph, Duke of Otranto (1763-1820), minister of Napoleon I. He was elected a member of the National Convention in 1792. On the fall of Robespierre (1794), Fouché managed to make friends with Barras, and was rewarded by the ambassadorship to Milan. He was afterwards appointed Ambassador to Holland, but ultimately recalled to Paris and made Minister of Police. He held this office at Napoleon's final abdication, and played an important part in the arrangements. He remained in office under Louis XVIII for a short time, and was afterwards Ambassador to Dresden.

Fougères, a town of North-East France, department of Ille-et-Vilaine. It has manufactures of flannels, sailcloth, and sacking. Pop. 23,150.

Fouillée, Alfred Jules Émile (1838-1912), French philosopher. At first a follower of Plato, Fouillée afterwards adopted the theory of empiricism, and endeavoured to connect Plato's idealism with the English doctrine of evolution. His works include: *Histoire de la philosophie* (1875); *La Science sociale contemporaine* (1880); *La Morale, l'art, et la religion d'après Guyau* (1889); *La Psychologie des idées-forces* (1893); *La Morale des idées-forces* (1907); *Le Socialisme et la sociologie réformiste* (1909); *Esquisse d'une interprétation du monde* (1912).

Foula, an island belonging to the Shetland group, but lying solitary some 20 miles to the west. It rises from the sea in lofty cliffs which swarm with sea-fowl. Pop. 239.

Foulis, Robert (1707-1776) and Andrew (1712-1775), Scottish printers. In 1739 Robert commenced business as a bookseller, and, having obtained the appointment of printer to the University, began to issue editions of the ancient classics, which became famous for their accuracy and beauty. The business was carried on by Robert's son, Andrew (died 1829).

Foundation, in engineering and archi-



ture, is the formation upon which a building or structure is erected. It is essential that the foundation should not move, and, consequently, clay on a hill-side, for instance, is to be avoided if possible, as clay so situated is apt to slip. The following table gives the usual permissible loads (Colonel Seddon):—

Material.	Tons per sq. ft.
Hard rock .. .. .	9.
Rock, of strength of good concrete .. .. .	3.
Very soft rock .. .. .	1-8.
Firm earth and hard clay .. .. .	1 to 1-5.
Clean dry gravel and clean sharp sand, prevented from spreading sideways .. .. .	1 to 1-5.

In places where running sand, or an unreliable formation, is encountered, piling is often used. Wooden piles, which may be anything up to 100 feet long, are driven downwards into the ground, sometimes two or three being driven one above the other, so that the deepest one may go down some 300 feet. The piles may be wooden beams, or they may be made of concrete. They are driven into the ground by a pile-driver. On the top of these piles a concrete raft is usually formed, which consists of a flat layer of concrete from, say, 3 inches to 5 feet thick. Submerged foundations include the foundations of breakwaters, bridges, &c. It is usual to form such foundations with sacks of Portland cement. Upon this artificial 'bed of rock' the structure is raised.—  
BIBLIOGRAPHY: W. M. Patton, *A Practical Treatise on Foundations*; C. E. Fowler, *Ordinary Foundations*.

**Founding.** That part of works devoted to the production of castings is known as the foundry. The moulds used are made of sand, viz. green sand, dry sand, and loam. Green-sand moulds are made of sand in the natural state, which is packed by ramming around a pattern, usually of wood, having the shape of the casting required. After thus shaping the mould the pattern is removed, and the space thus formed is filled with molten metal. Dry-sand moulds, after being prepared, are thoroughly dried in suitable ovens. In loam moulding a sand rich in clay is used, and the mould is built up on a case of bricks and shaped by hand. Machine moulding is largely used for small and medium-sized repetition castings. Chill moulds contain metal portions inserted, which increases the hardness of the parts

thus treated. For metals other than iron, steel or iron moulds are commonly used. The metal may be poured directly into the top from some sort of ladle, but in the case of sand moulds the metal is generally run in at the side or bottom by means of a separate channel known as a runner.

**Fount, or Font,** among printers, a quantity of types, in proportions sorted for use, that includes ordinary letters, large and small capitals, single letters, double letters, points, commas, lines, and numerals; as a fount of Pica or Bourgeois. A fount of 100,000 characters, which is a common fount, would contain 5000 types of *a*, 3000 of *c*, 11,000 of *e*, 6000 of *i*, 3000 of *m*, and about 30 or 40 of *k*, *x*, *y*, and *z*. But this is only to be understood of the ordinary types, capitals having other proportions.

**Fouqué, Friedrich Heinrich Karl**, Baron de la Motte (1777-1843), German poet and novelist. Several of his tales, *Der Zauberring* (Magic Ring), *Undine*, and *Aslaugas Ritter* (Aslauga's Knight), have been very popular. A translation of the last was made by Carlyle.

**Fouqué, Heinrich August**, Baron de la Motte (1698-1774), Prussian general in the Seven Years' War. Fouqué's *Mémoires*, containing his correspondence with Frederick the Great, are highly interesting.

**Fouquier-Tinville, Antoine Quentin** (1747-1795), French revolutionist. He was appointed Public Accuser before the Revolutionary tribunal. He proposed the execution of Robespierre and all the members of the Revolutionary tribunal in 1794, but was himself arrested, and died under the guillotine in a cowardly manner.

**Fourier, François Marie Charles** (1772-1837), French Socialist. His first book, *Théorie des quatre mouvements et des destinées générales*, was published in 1808; the *Traité de l'Association Domestique Agricole*, his most important work, in 1822; but it was not till the last years of his life that they attracted any notice. In his social system Fourier holds that the operations of industry should be carried on by *Phalansteries*, or associations of 1800 members combining their labour on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first

assigned for the subsistence of every member of the society, whether capable or not of labour. The remainder of the produce is shared in certain proportions to be previously determined among the three elements, labour, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends.

**Fourier**, Jean Baptiste Joseph (1768–1830), French mathematician. After serving in various political capacities under Napoleon, he was in 1815 admitted a member of the Academy of Sciences, and at a later period appointed secretary for life. In the opinion of Sir William Rowan Hamilton, Fourier was the greatest of the brilliant group of French mathematicians who flourished at the beginning of the nineteenth century, a group which included Laplace, Lagrange, Cauchy, and Poisson. His great work is the *Théorie analytique de la chaleur* (1822).

**Fourier Series**, infinite series involving cosines and sines of the successive multiples of a variable, i.e. series of the type

$$a_0 + a_1 \cos \theta + a_2 \cos 2\theta + a_3 \cos 3\theta + \dots \\ + b_1 \sin \theta + b_2 \sin 2\theta + b_3 \sin 3\theta + \dots$$

Any finite periodic function, subject to certain limitations of little practical moment, can be expressed by means of a Fourier series. This very important result is known as *Fourier's Theorem*. It was proved and applied to problems of heat conduction by Fourier in his beautiful work mentioned in the preceding article. In almost every branch of applied mathematics, Fourier series are indispensable.

**Fourmies**, a town of Northern France, department of Nord, with manufactures of woollens, glass, and ironware. Pop. 14,140.

**Fournet**, d'Artigue du (1856– ), French admiral. He became Commander-in-Chief of the French navy in 1915, had the supreme command over the Allied fleets in the Mediterranean, and obtained, in Oct., 1916, the surrender of the Greek navy.

**Fowey**, a municipal borough and seaport of England, in Cornwall, near the mouth of the River Fowey. It carries on an extensive export of china-clay. The

harbour can accommodate and coal vessels up to 10,000 tons. Pop. (1931), 2382.

**Fowl**. See *Poultry*.

**Fowler**, Sir John (1817–1898), British civil engineer. He was for many years engineering adviser to the Khedive of Egypt, and with Sir Benjamin Baker was chiefly responsible for the design of the Forth Bridge, opened in 1890.

**Fox**, Charles James (1749–1806), English statesman. He entered Parliament in 1768, and after being a supporter of the administration for six years, a quarrel with Lord North threw him into the ranks of the Whig opposition, where, along with Burke and others, he steadily assailed the Government, especially on the score of their American policy. On the defeat of the administration of Lord North, he obtained the office of Secretary of State for Foreign Affairs (1782). But the death of the Marquess of Rockingham suddenly divided the party; and when the Earl of Shelburne became First Lord of the Treasury, Fox retired. Soon after a union took place between his friends and those of Lord North, known as the *coalition ministry*, which was overthrown by Fox's famous East India Bill (1783). He took an active part against Warren Hastings, supported the efforts of Wilberforce against the slave trade, and moved the repeal of the Test and Corporation Acts. He welcomed the breaking out of the French Revolution, but eventually, on becoming Secretary for Foreign Affairs in 1806, not long before his death, acquiesced in the policy of war with France.

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**Fox**, George (1624–1691), the founder of the Society of Friends, or Quakers. In 1648 he commenced to preach publicly at Manchester, about which time he also adopted the peculiar language and manners of Quakerism. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1671 he went to America, where he remained two years, which he employed in making proselytes. On his return he was thrown into Worcester jail, where he remained for over a year. On his release he went to Holland for a short time. At the time of his death the Society of Friends (q.v.) had acquired considerable impor-

tance.—Cf. J. S. Rowntree, *The Life and Character of George Fox*.

**Fox**, an animal of the genus *Canis*, closely allied to the dog, with a straight bushy tail, elongated pupils, and erect ears. Foxes are found almost all over the world. *Canis vulpes* is the common fox, found in Europe and Asia; *C. lagopus*, the Arctic fox, with glossy white winter fur; *C. argentatus*, the silver or black fox, a native of the northern parts of Asia and America, with shining black fur; *C. virginianus*, the grey fox, common in North America; *Vulpes fulvus*, the American red fox, generally of a pale-yellow colour; *C. pennsylvanicus*, the cross fox, with grey fur marked by a dark cross on the shoulders; *C. velox*, found in the plains of North America, commonly called the kit fox; *C. leucopus*, the little desert fox of South-West Asia; *C. corsac*, the corsac, found in Central Asia.

**Fox-bats**, or **Flying-Foxes**, a name given to the fruit-eating bats of the family Pteropodidæ, including some of the largest of the bat tribe. They inhabit Australia, Java, Sumatra, and Borneo, as well as the continents of Asia and Africa.

**Foxe**, John (1517–1587), English Church historian. He studied at Oxford, and was elected a Fellow of Magdalen in 1543. During Mary's reign he went abroad, to Basle. On the accession of Elizabeth he returned to his native country. His principal work is the *History of the Acts and Monuments of the Church*, commonly called Foxe's *Book of Martyrs*, first printed in 1563, in one volume folio.

**Foxglove**, a common British plant, *Digitalis purpurea*, nat. ord. Scrophulariaceæ. It grows on banks, pastures, &c., in hilly and especially subalpine and rocky countries in Europe. Its flowers are campanulate, and somewhat resembling the finger of a glove. Its medicinal properties are due to the poisonous substance known as *digitalin* (q.v.). The flowers are usually purple, but sometimes white.

**Fox-hunting**. A pack of foxhounds consists of from 20 to 60 couples of hounds, according to the frequency of the hunting days. These dogs are under the superintendence of the *master*, who has the general control of the whole 'field'. Under him is the *huntsman*, whose duty it is to look after the hounds in their kennels and direct them in the field. Next him are the *whippers-in*. The hunts-

men assemble and draw the neighbouring coverts by throwing off the dogs to search for the fox. The person who first sees the fox leave the covert, *break cover* as it is called, gives the *view-halloo* after it has got some little distance, upon which the huntsman collects his hounds and sets off in a chase followed by the entire field. The foxhounds follow almost entirely by scent, the fox being itself perhaps far ahead and out of sight. The rider who is first in at the death lashes the hounds off and secures the head, feet or *pads*, and tail or *brush* of the fox. The midland counties of England, Leicestershire, Warwick, Yorkshire, &c., are the most celebrated for fox-hunting.

**Fox Indians**. See *Indians, American*.

**Fox River**, a river of Wisconsin, U.S.A., which enters Green Bay, an arm of Lake Michigan, after passing through Lake Winnebago. It is connected by canal with the River Mississippi.

**Foxtail-grass**, the common name given to the grasses of the genus *Alopecurus*, of which six species are native to Britain. *A. pratensis* is an abundant natural grass in meadows and pastures, and is an excellent fodder plant. See *Plate, Grasses*.

**Foy**, Maximilian Sebastian (1775–1825), French general. From 1808 to 1812 he was general of division of the army in Portugal. In 1812, after the defeat of the French at Salamanca, he succeeded Mar-mont as Commander-in-Chief. He was present at all the battles of the Pyrenees, until he was dangerously wounded at Orthez in 1814. In 1815 he commanded a division at Waterloo, where he was wounded for the fifteenth time. In 1819 he was appointed Division-Inspector of Infantry.

**Foyle**, a river of Ireland, which flows through Tyrone, Donegal, and Londonderry into Lough Foyle below the city of Londonderry. It is navigable up to Londonderry for vessels of 800 tons.

**Foyle, Lough**, the estuary of the River Foyle, on the north coast of Ireland, between the counties of Londonderry and Donegal.

**Fracture**, in mineralogy, is the manner in which a mineral breaks so that its texture is displayed. The fracture may be *even*, *uneven*, *conchoidal*, *fibrous*, or *hackly* (with many fine sharp points). The same term is used in connexion with metals and alloys. The fracture of metals

is usually described as crystalline, granular, fibrous, silky, columnar, conchoidal, or

Framboesia. See Yaws.

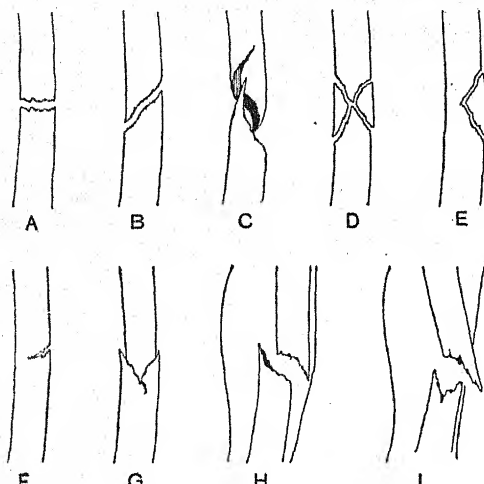
Framlingham, a market town of England, Suffolk, north of Ipswich, with extensive remains of a castle. Pop. 2400.

Franc, a modern French silver coin, the unit of the decimal monetary system. The original gold franc (value 10s. 6d.) was named from the device *Francorum Rex*, King of the French, on the coin, when first struck by King John II in 1360. These coins, called *francs à cheval*, disappeared during the latter half of the fifteenth century. The silver franc, or *franc d'argent*, was worth twenty *sous*. The modern French franc was introduced in 1795, is of the nominal value of a little over 9½d. English, and is divided into 100 centimes.

Francavilla, several places in Southern Italy. The most important is in the province of Lecce, 14 miles w.s.w. of Brindisi. Pop. (town), 17,759; (commune), 20,510.

France, Anatole, assumed name of Jacques Anatole Thibault (1844–1924), French author. The son of a bookseller, he was brought up in a literary atmosphere, and educated at the Collège Stanislas, Paris. Devoting himself to literature,

he made his entry into the world of letters in 1868 with his study on *Alfred de Vigny*. This essay was followed by many editorial prefaces to the works of French classics, by his *Poèmes dorés*, *Les Noces Corinthiennes*, and *Le Chat maigre*. He first attracted attention, however, in 1882, with his *Le Crime de Sylvestre Bonnard*, which was crowned by the Academy. This work placed the young author in the first rank of French novelists. His books are at once novels and works of criticism, revealing an author who is both a charming story-teller and a subtly reasoning philosopher. They are not only tales of romance and adventure, but essays on art, religion, and philosophy, full of original sayings and discussions on history and morality. Among his numerous works, the majority of which have appeared in English, are *Le Livre de mon ami* (1885), *Thais* (1890), *La Rôtisserie de la Reine Pédauque* (1893), *M. Bergeret à Paris* (1901), *Crainquebille* (1902), *Histoire de Jeanne d'Arc* (1904), *L'Île des Pingouins* (1908), *Les Dieux* (1910).



Fractures

A, Transverse. B, Oblique. C, Spiral. D, Star-shape or Stellate. E, Greenstick. F, Impacted. G, Simple (skin not broken). H, Simple (skin broken). I, Compound (skin broken).

laminated, according to its general appearance.

Fracture, in surgery, the breaking of a bone. Various types of fracture are shown in the illustration.

Fra Diavolo (1760–1806), Neapolitan brigand, whose real name was Michele Pezza. After being a monk and a brigand chief, he was pardoned by the Government, and given a colonel's commission. At the head of his band he harassed the French, took refuge in Calabria after the conquest of Naples by Bonaparte, and incited the people against the French. He fell at last into their hands in 1806, and was executed as a robber and incendiary.

Fragonard, Jean Honoré (1732–1806), French painter and engraver. He was one of the most distinguished painters of the Rococo period in France, depicting the charm, frivolity, and gaiety of the old régime. *The Bathers*, *The Sleeping Bacchante*, and *The Storm* are in the Louvre; *The Swing* and *Le Chiffre d'amour* are in the Wallace Collection.



*Soif* (1912), *La Révolte des Anges* (1914), and *La Vie en fleur* (1922). He was awarded the Nobel Prize for literature in 1921. — BIBLIOGRAPHY: G. Brandes, *Anatole France*; W. L. George, *Anatole France*.

France, a maritime country in the west of Europe, bounded by the Straits of Dover, Belgium, Germany, Switzerland, Italy, the Mediterranean, the Pyrenees, the Bay of Biscay, and the English Channel. The area is 212,659 sq. miles, and the population in 1926 was 40,743,851. The coast-line is considerably diversified, there are numerous bays and inlets affording excellent anchorage, and there are many splendid ports. The principal islands are Ushant, Belle Ile, Ile d'Oléron, and Corsica. The capital is Paris, and other large towns (in order of population) are Marseille, Lyons, Bordeaux, Lille, Nantes, Toulouse, St. Etienne, and Strasbourg. The interior is traversed from south-west to north-east by successive chains of mountains, including the Pyrenees, the Cevennes, the Côte d'Or, and the Vosges, which form the watershed between the rivers flowing to the Atlantic and those flowing to the Mediterranean. In the extreme north-east this system is met by the Alps and the Jura. A considerable portion of the western Alps belongs to France, and several Pyrenean peaks are within its borders. Near the centre of the country are several volcanic groups known collectively as the Mountains of Auvergne. The spurs thrown off by the great watershed divide France into seven main river basins. Six of these flow to the Atlantic: (1) the Garonne, with its affluents the Tarn, Lot, Arriège, Dordogne, and Gers, and its two secondary basins, Charente and Adour; (2) the Loire, with its tributaries the Maine, Allier, Cher, &c.; (3) the Seine, with its affluents the Aube, Marne, Oise, Yonne, and Eure, and the secondary basin of the Somme; (4) the Meuse, with its affluent the Sambre; (5) the Schelde, with its affluent the Scarpe; (6) the Moselle, flowing to the Rhine. The seventh basin, occupying the whole of the territory south-east of the watershed, is that of the Rhone, with its tributaries the Ain, Saône, and Ardèche, and the secondary basins of the Var and Aude. There are no lakes worthy of mention. France lies almost wholly within the moderate portion of the temperate zone.

In the south and south-east, where the climate is warmest, the olive is grown, while the cultivation of maize extends farther north. A line from the mouth of the Loire to Mezières in the Ardennes department marks the limit of profitable vine cultivation. North of this again is the fifth and coldest region. The main features of the French climate are its healthiness and brightness. Of the total area of France about nine-tenths are productive, and fully a half is arable. Wheat, oats, rye, and barley are the principal cereals, and potatoes, hemp, rape, maize, buckwheat, and flax are also grown. In 1928 the area under cereals was 25,800,000 acres. Beets are cultivated for the manufacture of sugar, and some tobacco (a Government monopoly) is produced. Cattle-breeding is not practised to any great extent, but sheep-rearing and horse-breeding are important. The cultivation of the vine is one of the main branches of French agriculture, and vineyards cover almost 4,000,000 acres. France is the greatest wine-producing country in the world, and such wines as Champagne, Bordeaux, Burgundy, &c., are universally known. The total wine production in 1928 was 1,274,000,000 gallons. Other fruit trees are the apple (particularly in Normandy), pear, plum, orange, citron, fig, &c. In the south-east, where silkworms are reared, the mulberry tree is cultivated; and in Central France the chestnut is a staple food of the lower classes. Eighteen per cent of the total area is under forests. The minerals include coal, iron, lead, zinc, manganese, copper, &c., the chief coal-fields being those of the departments Nord, Loire, Pas-de-Calais, and Moselle (Lorraine). The principal deposits of iron ore are in Normandy and Lorraine. There are several salt-mines, but the largest supply is obtained from lagoons and marshes on the sea-coasts. Oil-wells are situated around Pechelbronn in Alsace, and produce about 100,000 tons per year. The most important textile manufacture is that of silk and artificial silk, the centre of which is Lyons. Silk fabric, hosiery, and knitted goods are made at Lyons, Troyes, Lille, &c. The manufacture of cottons and woollens is centred in Reims, Amiens, Tourcoing, and in Alsace; of carpets in Abberville; of tapestry in Paris and Beauvais; of linen in Lille, Armen-

tières, and Cholet; and of lace in Calais, Caudry, and St. Quentin. Other manufactures are cutlery, porcelain, beet-sugar, leather, jewellery, clocks, &c. The European War had an extremely detrimental effect on industry and commerce, particularly in the ten devastated departments. The post-war recovery was, however, hardly less phenomenal than in Belgium, and within seven years production was well up to the 1913 standard in these departments, the main difficulty being shortage of labour. French fisheries are important, and include sardines in the Bay of Biscay; herring, turbot, &c., in the North Sea; tunnies and anchovies in the Mediterranean; and cod off Newfoundland. There are extensive oyster-beds in the basin of Arcachon, department of Gironde. A huge national fishing-port has been constructed at Kergroise, near Lorient, and others have been authorized at Boulogne, La Rochelle, and at either Cette or Port-de-Buoc. The principal features of French trade have always been a stringent policy of protection and prohibition of export of certain commodities. The value of French trade in 1929 is given in the following table in millions of francs:

Commodity.	Import.	Export.
Food .. ..	13,178	6,068
Raw materials ..	35,160	12,560
Manufactures ..	9,947	31,449
Postal packets ..	—	1,661
Totals ..	58,285	51,729

The principal exports from France in 1929 were, in millions of francs:

Articles.	Value.
Chemical products .. ..	3451
Silk goods .. ..	3028
Cotton goods .. ..	2702
Iron and steel .. ..	2387
Clothing .. ..	1843
Automobiles .. ..	1566
Wines .. ..	1173
Soaps and perfumes .. ..	859

Great Britain and Belgium are the most important customers of France, taking respectively 15 and 14 per cent of her

exports. Germany, which takes 9 per cent, comes next. Great Britain and the United States are the principal importing countries. There are in France about 25,000 miles of national roads, and 26,000 miles of railways. About 1000 miles of railway have been electrified, and further schemes for electrification have been drawn up. France has an excellent system of inland waterways extending to 8770 miles (actually navigated). This includes 3280 miles of canals, the depth, width, and general utility of which are increased almost every year. The French mercantile marine had (1928) over 2000 ships of 3,441,000 gross tons (sailing ships 280,000 tons). The chief ports are Marseille, Rouen, Bordeaux, Dunkirk, Havre, and Nantes. St. Nazaire is the great ship-building centre, Cherbourg is the port of call for transatlantic liners, and Toulon, Brest, Lorient, and Cherbourg are the chief naval bases. In France the superintendence of education in all its branches is committed to the Minister of Public Instruction and Fine Arts, who is assisted by an educational council. The system is highly efficient, and primary instruction is compulsory and free. Secondary education, classical, commercial, or industrial, is given by the State in the lycées, and by the communes in the communal colleges. There are also numerous art, technical, and training institutions of various kinds. Paris has a university, besides the Collège de France, the École Polytechnique, &c., and there are also universities in Aix-en-Provence, Besançon, Bordeaux, Caen, Clermont-Ferrand, Dijon, Grenoble, Lille, Lyons, Montpellier, Nancy, Poitiers, Rennes, Strasbourg, Toulouse, and Algiers. France has a coast-line of 1760 miles and a land frontier of 1665 miles. To defend these there are the fortified naval harbours of Toulon, Rochefort, Lorient, Brest, and Cherbourg, and the first-class land fortresses of Strasbourg, Metz, Thionville, Verdun, Toul, Epinal, and Belfort. It is doubtful if these land defences will be maintained. Military service is compulsory on attaining the age of nineteen. The metropolitan army has a peace strength of about 400,000 (including the Air Force establishment of 37,000). In addition there is the colonial army, with a peace strength of 150,000 (white and native). The French

navy is manned partly by conscription and partly by voluntary enrolment. The effective war navy of France is of considerable strength. There is a reserve of 114,000 men, of whom about 25,500 are serving with the fleet.

France has been a republic since the overthrow of the Second Empire in 1870. The details of the Constitution were fixed by a law passed by a National Assembly

the French monetary system is the franc, which is divided decimally. The par value of the franc is 124.21 to the pound sterling (i.e. 1 franc = 1.9d.). The system of weights and measures is also decimal, the units with their English equivalents being as follows: the *mètre* = 39.37 inches; the *kilomètre*, or 1000 *mètres* = 1093.6 yards; the *are*, the square of 10 *mètres* = 1076.441 sq. feet; the *hectare*, or 100 *ares*



which met in 1871, and the constitutional law, confirming the republican Government, was passed in 1875, and modified in 1879, 1884, 1885, and 1889. This law places the legislative authority in the hands of an Assembly composed of two chambers, the Chamber of Deputies and the Senate. The head of the State is the President, who is assisted by a body of ministers appointed by him. The unit of

= 2.47 acres; the *square kilomètre* = .386 of a sq. mile; the *stère* or *cubic mètre* = 35.317 cubic feet; the *litre* = 1.76 pints; the *hectolitre*, or 100 *litres* = 22.0097 gallons; the *gramme* = 15.4323 grains; the *kilogramme*, or 1000 *grammes* = 2.205 lb. At the Revolution the whole of France, including Corsica, was parcelled out into departments, and each department subdivided successively into arron-

dissements, cantons, and communes. This division, carried out in 1790, has since maintained its ground. There are now ninety departments, including the three departments (Bas-Rhin, Haut-Rhin, and Moselle) of Alsace-Lorraine transferred to France by the Peace Treaty of 1919, and the territory of Belfort, remnant of the former department of Haut-Rhin. The total area added to France as a result of the European War was 5605 sq. miles. In addition she has control of the Saar basin till 1934. The French colonial empire has an area of 5,383,035 sq. miles, and a population of 53,728,900. See list under *Colony; Mandated Territories*; and consult separate articles. The state of Andorra in the Pyrenees is under the joint suzerainty of the President of France and the Spanish Bishop of Urgel.

*History.*—The south-east of France or Gaul (formerly inhabited by tribes of Celtic origin) was in the second century B.C. conquered by the Romans, the conquest of the whole country being completed under Julius Caesar between 58 and 51 B.C. Subsequently the country became completely Romanized. In the decline of the Roman Empire, German tribes began to make settlements in Gaul, and it was from a body of these, known as *Franks*, that the name France arose. Towards the end of the fifth century Clovis, chief of the Salian Franks, made himself master not only of almost all France, but also of a considerable territory east of the Rhine, and founded the Merovingian dynasty. Clovis died in 511, leaving his kingdom to be divided amongst his four sons. The Frankish dominions were thus differently divided at different times; but two divisions, a western and an eastern, or Neustria and Austrasia, became the most important. Pépin d'Héristal conquered Neustria and made his sway supreme throughout the kingdom of the Franks. This may be regarded as the real termination of the Merovingian line. Pépin died in 714, and was succeeded, after a brief period of anarchy, by his son Charles Martel. During his tenure of power all Europe was threatened by the Saracens, whom he totally defeated near Tours in 732. Charles Martel died in 741, leaving Austrasia and the countries beyond the Rhine to his son Carloman, and Neustria and Burgundy to his son Pépin the Short. On his brother's death Pépin

seized his heritage, and in 752 had himself crowned King of the Franks. In 768 he died, and was succeeded by his sons Charles, afterwards known as Charlemagne (Charles the Great), and Carloman. The latter dying in 771, Charlemagne then became sole ruler, and conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian Mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III on Christmas Day in the year 800 he was crowned in the name of the Roman people as Emperor of the West. To Charlemagne succeeded in 814 his youngest son Louis the Pious. At his death the empire, after many disputes, was eventually divided by the Treaty of Verdun in 843 amongst his sons, the portion nearly corresponding to modern France falling to Charles the Bald. From this time the separate history of France properly begins. After Charles the Bald, the first of the Carolingian kings, had been succeeded in 877 by Louis II, and Louis II by Louis III (879–882) and Carloman (879–884), Charles the Fat, king of the eastern Frankish territory, became ruler of the western also till 887, when he was deposed. After a brief usurpation by Eudes, Count of Paris, Charles III, the brother of Louis III, was recognized as king. But France was divided into a number of great fiefs, the possessors of which, though acknowledging the feudal supremacy of Charles, were practically independent. Charles, being unable adequately to resist the Normans, in 912 ceded to them the province which became Normandy. Towards the end of his reign Hugh of Paris was the most powerful person in the kingdom, and throughout the reigns of Louis IV, Lothaire, and Louis V he and his son Hugh Capet held the real power. On the death of Louis V without children in 987 Hugh Capet mounted the throne himself, and thus became the founder of the Capetian dynasty. The great fiefs of Paris and Orleans were thus added to the Crown, and Paris became the centre of the new monarchy. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I (died 1060), and Philip I (died 1106), effected nothing whatever. Louis VI was more successful. He died in 1137, and was succeeded by his son



Louis VII, who reigned till 1180. During his reign the stability of the French throne was endangered by the influence acquired in France by Henry II of England, who possessed the whole of the west of France except Brittany. Louis was succeeded by his son Philip Augustus (Philip II), who did much to strengthen the throne, depriving John, King of England, of Normandy, Maine, and Anjou. His son Louis VIII, who succeeded in 1223, carried on the work by the conquest of Poitou and Toulouse. Louis VIII died in 1226, and under the wise rule of Louis IX (St. Louis) the influence of the Crown went on increasing, as it did also under Philip (III) the Bold (died 1285), Philip (IV) the Fair (died 1314), Louis X (died 1316), John I (died 1316, after a reign of five days), Philip V (died 1322), and Charles IV (died 1328). The first branch of the Capetian line of kings became extinct on the death of Charles IV. The crown thus fell to Philip of Valois, a cousin, who became king as Philip VI. His claim was disputed by Edward III of England, and the dispute led to a series of wars which were not terminated for more than 120 years. Edward, victorious over Philip VI, and after his death over John (II) the Good, who was taken prisoner at Poitiers in 1356, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360. Charles (V) the Wise succeeded John the Good in 1364, and during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI (1380-1422), during which Henry V of England invaded France, won Agincourt, and obtained a treaty (Treaty of Troyes) which secured the right of succession to the French crown for himself and his descendants. Charles VI died in 1422, a few weeks after Henry V, whose son, Henry VI, a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431 the peasant girl *Joan of Arc* animated the French in the cause of the dauphin, who was crowned as Charles VII at Reims in 1429, and in 1451 the English had lost all their possessions in France except Calais. The shrewdness and perfidy of Louis XI (1461-1483) completed the subjugation of the great barons, and laid the foundation of absolute monarchy.

Maine, Anjou, and Provence were left to him by the will of the last count, and a large part of the possessions of the Duke of Burgundy came into his hands not long after the death of Charles the Bold in 1477. His son and successor, Charles VIII (1483-1498), also united Brittany to the Crown by his marriage. Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII. In order to keep Brittany attached to the Crown he married the widow of his predecessor. On his death the crown reverted to another branch of the House of Valois, that of Angoulême, in the person of Francis I (1515-1547). Francis I, still continuing the attempts at conquest in Italy, was brought into conflict with Charles V of Germany, who also claimed Milan as an imperial fief. The result was five wars between France and Germany. Francis I died in 1547, and his son, Henry II (1547-1559), renewed the war with the House of Habsburg. In the Peace of Cateau-Cambrésis (1559), with which it ended, Henry gained the German bishoprics of Metz, Toul, and Verdun. The year before, Calais, the last English possession in France, had been captured by Francis, Duke of Guise. Francis II, the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559-1560). The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Under the administration of Charles IX (conducted during his minority by the queen-mother, Catherine de' Medici) France was inundated with the blood of Frenchmen, shed in religious wars from 1562 (see *Bartholomew, Massacre of St.*). These continued throughout the reign of Charles IX and his successor, Henry III (1574-1589), and were only terminated when Henry IV, originally King of Navarre, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots. Henry IV, the first French sovereign of the House of Bourbon, united to the Crown of France the kingdom of Navarre. He was assassinated in 1610. During the minority of Henry's son, Louis XIII, the Prime Minister, Cardinal Richelieu, restored the French influence in Italy and the Netherlands, humbled Austria and

Spain, and created that domestic government which rendered the Government completely absolute. Louis XIII died in 1643, the year after his great minister, and was succeeded by Louis XIV, 'le Grand Monarque'. The policy of Richelieu was carried on by Mazarin, during whose ministry France obtained by the Peace of Westphalia (1648) the German province of Alsace, and by the Peace of the Pyrenees (1659) parts of Flanders, Hainault, Luxembourg, &c. After the death of Mazarin, in 1661, Louis XIV took the government into his own hands, and ruled with an absolute sway. The period which immediately followed was the most brilliant in French history. His ministers, especially Colbert, and his generals, Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; the writers of the period were also among the greatest in French literature. An unsuccessful attempt was made on the Spanish Netherlands; a war was undertaken against Holland, Spain, and Germany, which ended in France receiving Franche Comté and other places from Spain, and Freiburg from Germany. In 1681 Strasbourg was seized from the empire in a time of peace. The last war of Louis was the War of the Spanish Succession (1701-1714), which resulted unfortunately for France. He revoked the Edict of Nantes in 1685. Louis XIV died in 1715, leaving a national debt amounting to no less than 4,500,000,000 livres. Louis XV, the great-grandson of Louis XIV, succeeded at the age of five years. In 1723 Louis was declared of age, but he sank under the pernicious influences of mistresses like Pompadour and Du Barry, entering into useless and costly wars (War of Austrian Succession, 1740-1748; Seven Years' War, 1756-1763), and contracting enormous debts. During this reign two important acquisitions were made by France, namely, Lorraine and Corsica. With the reign of Louis XVI began the period of expiation for the misdeeds of the French monarchy and aristocracy, which had culminated in the preceding reign. The king himself was amiable, but the whole administration was rotten, and the good intentions of Louis were neutralized by a total lack of energy and firmness. The first difficulty of his Government, and the rock on which it split, was the hopeless condition of the

public finances, with which Turgot, Necker, Calonne, Brienne, and again Necker tried in vain successively to grapple. Finding all ordinary measures unavailing, Necker demanded the convocation of the States General, which had not met since 1614. They met on 5th May, 1789, but as the nobles and clergy refused to give the Third Estate its due weight in the conduct of business, the Deputies of this body assumed the title of the National Constituent Assembly, and resolved not to separate till they had given a Constitution to France. The clergy and nobles then yielded, and the fusion of the three orders was effected on 27th June. Foreign troops, however, were brought to Paris to overawe the Assembly. The people now demanded arms, which the municipality of Paris supplied; and on 14th July the Bastille was captured and destroyed. Lafayette was made commander of the newly established National Guard. On the 4th Aug. a decisive step was taken by the abolition of all feudal rights and privileges. On 5th Oct. Versailles was attacked by the mob, and the royal family, virtually prisoners, were taken to Paris by Lafayette. The king made his escape from Paris (20th June, 1791), but was recognized, arrested at Varennes, and brought back to Paris. On 30th Sept., 1791, the Assembly brought its work to a finish by producing a new Constitution, which was sworn to by the king on 14th Sept. The Constituent Assembly was, according to the Constitution, immediately followed by the Legislative Assembly, which met on 1st Oct., 1791, and in which there were two parties of political importance, the Girondists, moderate republicans, so named because their leaders came from the department of the Gironde, who led it, and the Montagnards, extreme radicals, known collectively as the Mountain, because their seats were the highest on the left side of the hall, who subsequently became all-powerful in the Convention. The constitutionalists and monarchists were already powerless. The declaration of Piltitz by the Emperor of Germany and the King of Prussia, threatening an armed intervention on behalf of the king, compelled the Assembly to take a decisive course, and on 20th April, 1792, war was declared against Austria and Prussia. Reverses to the French troops caused a popular rising, and the Tuileries, after a sanguinary

combat, were taken and sacked. The king took refuge with his family in the Assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a National Convention in place of the Assembly. The first act of the Convention was to proclaim a republic. On 3rd Dec. the king was cited to appear before it, was sentenced to death, and executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, and Spain joined the coalition. The extremists in France only grew more violent, a Committee of Public Safety, with sovereign authority, was appointed 6th April, and the Reign of Terror began. A new Constitution was adopted by the Convention on 23rd June, called the Constitution of the Year I, the Republican Calendar being adopted on 5th Oct., 1793, the year I beginning on the 22nd of Sept., 1792. Christianity was formally abolished. Both in Paris and the provinces executions and massacres of persons alleged to be disaffected to the party in power followed each other daily. The queen was executed on 16th Oct., 1793, the Girondists on 31st Oct., and others followed, Robespierre being foremost in the bloody work. At length the Reign of Terror came to an end by the execution of Robespierre and his associates on 27th and 28th July, 1794. Danton and Hébert, his old allies, he had already brought to the scaffold. Marat had perished by assassination. The campaigns of 1793 and 1794 resulted favourably to the French arms, which were carried beyond the French frontier, Belgium and Holland being occupied, Spain being invaded, and the Allies being driven across the Rhine. These successes induced Prussia and Spain to sign the Treaties of Basle (1795), recognizing the French Republic. In 1795 the Convention gave the republic a new Constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients* to approve them, and an executive of five members, one elected annually, called the *Directory*. The Convention was dissolved on 26th Oct. Napoleon Bonaparte now began to be the most prominent figure in French affairs. He overthrew the *Directory* in the revolution of 18th and 19th Brumaire (9th-10th

Nov., 1799), and had himself appointed *First Consul* for ten years. The other two Consuls, Cambacérès and Lebrun, were to have consultative voices only. The new Constitution was proclaimed on 15th Dec. Under the appearance of a republic it really established a military monarchy. The history of France for the next sixteen years is virtually the history of Napoleon (q.v.). In 1802 the Constitution was amended, Napoleon being made Consul for life, with the right of appointing his successor. In 1804 he was proclaimed Emperor, this being confirmed by a popular vote of 3,572,329 against 2569. The emperor was consecrated at Paris by Pius VII, and in 1805 he was also crowned King of Italy. For years the Continental powers, whether singly or in coalitions, were unable to stand against him, though at sea France was powerless after Trafalgar (1805). The Austrians and Russians were decisively defeated at the great battle of Austerlitz (1805); the King of Naples was dethroned, and Napoleon's brother Joseph put in his place; another brother, Louis, was made King of Holland; while for a third, Jerome, the Kingdom of Westphalia was erected (1807). Prussia was conquered, and compelled to accede to humiliating terms. Napoleon was at the height of his power in 1810 and 1811. By this time, however, the Peninsular War (q.v.) had broken out, which was one immediate cause of his downfall, the disastrous Russian campaign of 1812 being another. A new coalition was now formed against Napoleon, and in 1813 he was disastrously defeated by the Allies at the great battle of Leipzig. By this time the Peninsular War was drawing to a close, and Southern France was actually invaded by Wellington. The Allies entered Paris on 31st March, 1814. Napoleon abdicated, and received the Island of Elba as a sovereign principality. Louis XVIII was proclaimed King of France, and concluded the Peace of Paris (30th May, 1814). A congress of the Great Powers had assembled at Vienna to adjust European affairs, when it was announced that Napoleon had left Elba, returned to Paris 20th March, 1815, and been reinstated without resistance in his former authority. The allied sovereigns proclaimed him an outlaw, and renewed their alliance against him. Napoleon, anticipating the attack, crossed the Sambre with 130,000 men,

defeated Blücher in the battle of Ligny, and marched against the British, who had taken position at Waterloo. Here on the 18th June was fought the decisive battle which resulted in his final overthrow. On the 7th July the Allies entered Paris for the second time. Napoleon surrendered to the British, and was sent to St. Helena as a prisoner. Louis XVIII at first governed with the support of a moderate Liberal party, but the reactionary spirit of the aristocrats and returned *émigrés* soon got the upper hand; the country, however, was prosperous. Louis having died 16th Sept., 1824, his brother, Charles X, succeeded. On 26th July, 1830, the Polignac ministry published ordinances suppressing the liberty of the press and creating a new system of elections. The result was an insurrection during the three days 27th-29th July, by which Charles X was overthrown and Louis Philippe of Orleans proclaimed king 9th Aug., 1830. Under the ministry of Guizot, a policy of resistance to all constitutional changes was adopted, and a strong opposition having been formed, on 24th Feb., 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and Louis Napoleon, nephew of the great Napoleon, was elected President for four years. The President, having gained the favour of the army, dissolved the Legislative Assembly on 2nd Dec., 1851, put down all resistance in blood, and by this *coup d'état* established himself as President for the further term of ten years. A plebiscite of 7,839,216 votes confirmed the appointment. On 2nd Dec., 1852, the President was declared emperor under the title of Napoleon III (a son of the great Napoleon being counted as Napoleon II); and a plebiscite of 7,824,129 votes was again got to confirm the appointment. The Crimean War (1854-1856) and the war against Austria on behalf of Italy (1859) distinguished the early part of his reign. The latter greatly aided in the foundation of a United Italy, and gave France the territories of Savoy and Nice (1860). In 1870 the uneasiness of Napoleon and the French at the steady aggrandizement of Prussia broke out into flame at the offer of the Spanish crown to a prince of the House of Hohenzollern. France, not satisfied with the renunciation of the German prince, demanded a guarantee from the King of

Prussia that the candidature should never be resumed. This being refused, France declared war. One French army was driven back by the Germans and cooped up in Metz, another was pushed northwards to Sedan, and so hemmed in that it had to surrender with the emperor at its head. On the news of this disaster reaching Paris the Republic was proclaimed. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th Jan., 1871), and the war ended in France giving up to Germany Alsace and a part of Lorraine, and paying a war indemnity of five milliards of francs (£200,000,000). Meanwhile civil war had broken out in Paris, which was suppressed with great difficulty (see *Commune of Paris*). The Assembly elected in 1871 for the ratification of peace with Germany found it expedient to continue their functions, Thiers being the head of the administration. In 1873 the Thiers administration was overthrown and replaced by one under Marshal MacMahon. In 1875 a republican Constitution was drawn up. In 1879 MacMahon resigned his presidency before its legal expiry, being succeeded by Jules Grévy, who was followed by Carnot (assassinated), Casimir-Perier, Faure, Loubet, Fallières, Poincaré, Deschanel, Millerand, and Doumergue. In 1881 France occupied Tunis as a protectorate; in 1883 and 1884 she extended her influence over Tonquin and Annam; in 1895 she reduced Madagascar to submission.

Since the establishment of the Republic the reactionary and royalist parties have never disarmed, but all their endeavours to overthrow the Republic have failed. One of the principal crises which threatened France in modern times was that of Boulangism (see *Boulanger*). The Dreyfus (q.v.) Affair also divided the country into two camps. Many reforms, social and religious, were the result of the activity of the Republican Government, one of the chief being the separation of Church and State in 1905. Abroad France steadily pursued her policy of colonial expansion. In 1891 she concluded an alliance with Russia, which was strengthened between 1899 and 1906 when Delcassé was Minister for Foreign Affairs. Cordial relations were also established with Italy, thus weakening the Triple Alliance. In 1904 an Anglo-



French agreement was concluded, and France obtained territorial concessions in West Africa, and the right to maintain order in Morocco. The Algeiras Conference of 1906 decided that France should be given certain customs rights on the Algerian frontier. Germany protested in 1908 and in 1911 against the extension of the French sphere of influence, and the Kaiser sent a warship to Agadir to protect German interests. France, however, emerged triumphant, and in 1912 she secured a practical protectorate over Morocco. In 1913 Raymond Poincaré was elected President of the Republic, and a firm foreign policy was inaugurated. When the European War at last broke out, it found France unprepared (see *European War*). The situation, however, was saved by Clemenceau, who became Premier in Nov., 1917, and by Marshal Foch. As a result of the European War France retrieved her lost provinces, Alsace and Lorraine. In 1921 diplomatic relations between France and the Vatican were again resumed. France passed through a period of acute economic stress in 1925-1926. — **BIBLIOGRAPHY:** John Buchan, *France* (The Nations of To-day Series); J. H. MacCarthy, *The French Revolution*; R. Poincaré, *How France is Governed*; A. Hassall, *The French People*; F. Funck-Brentano (editor) *The National History of France*.

**French Language.**—At the time of the conquest of Gaul by Julius Caesar, the principal dialects spoken by the inhabitants were Celtic. After the conquest of Gaul by the Romans, all these dialects were gradually supplanted by Latin, except in Brittany, where a Celtic dialect still holds its ground. Besides the Celtic words, not very numerous, which were imported into the new speech, it was considerably modified by Celtic habits of speech, new sounds being introduced, and eventually was called *Romana* as distinct from *Latina*. It was still further modified by the influences introduced with the Teutonic invasions. After the Franks in Gaul had abandoned their native language and adopted this new Romanic or Romance tongue, it became known as the *Francisca*, later *Franceis*, from which the modern term *French* is derived. In the ninth and tenth centuries two main groups of dialects came to be recognized, the *Langue d'Oc*, spoken in

the districts south of the Loire, and the *Langue d'Oïl*, spoken in the provinces of the north and the east. The former may be said to have reached its height in the Provençal poetry and dialect, known especially in connexion with the Troubadours. In the thirteenth century the political superiority of the north threw the *Langue d'Oc* into the shade, and a dialect of the *Langue d'Oïl* came to be regarded as the classical language of the country, all other dialects sinking into the condition of *patois*. At the beginning of the sixteenth century Francis I prohibited Latin, and formally recognized the French as the national language. — **BIBLIOGRAPHY:** A. Brachet, *Historical Grammar of the French Tongue*; G. G. Nicholson, *Practical Introduction to French Phonetics*.

**Literature.**—French literature may be said to begin in the eleventh century with the epic or narrative poems known as *chansons de geste*, and produced by the class of poets known as *Trouvères* (q.v.). One of the oldest and best examples of these poems is the *Chanson de Roland* (Song of Roland). The *Roman de Rou* and *Roman de Brut*, the *Alexandre* by Lambert li Cors, and *La Guerre de Troie* (War of Troy) by Benoît de St. More are other examples. Out of the *chansons de geste* grew the *romans d'aventures*. Distinct from these are the *fabliaux*, metrical tales of a witty, sarcastic kind, belonging mostly to the twelfth or thirteenth centuries. Allied to these is the *Roman de Renard* (see *Renard the Fox*).

Side by side with these epics, romances, and tales, an abundant lyric poetry flourished from the eleventh century. Amongst the principal of the early lyricists are Thibaut de Champagne (1201-1253) and Charles of Orleans (1391-1465). The latter, a graceful writer of ballades and rondels, was amongst the last of the real Trouvères. The *Roman de la Rose*, the work, in its earlier part, of Guillaume de Lorris, who lived in the first half of the thirteenth century, in the later, of Jean de Meung (died 1320), is one of the most notable productions of the time. Olivier Basselin (who died about 1418) wrote songs celebrating the praises of wine. François Villon (1431-1500), the greatest of French poets before the Renaissance, wrote two compositions known as the *Great* and the *Little Testament*.

In prose literature the first important work is the *Histoire de la conquête de Constantinople* by Villehardouin (1167-1213). The *Mémoires* of the Sieur de Joinville (1223-1317) delineates the life of St. Louis and the exploits of the last Crusade. Froissart (1337-1410) gives a vivid picture of the chivalry of the fourteenth century. With Philippe de Commines (1445-1509) we are introduced to Louis XI and his contemporaries. In lighter prose the *Cent Nouvelles Nouvelles* already shows the power of the French language for the short, witty tale.

The revival of classical learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Rabelais (1483-1553) and Montaigne (1533-1592) hold the first rank. Calvin (1509-1564) did much by his great theological work, *Institution de la religion Chrétienne*, to mould French prose in the direction of strength and gravity. Amongst the other works which indicate the rapid development of French prose in this century are Brantôme's *Mémoires*, the *Heptaméron* of Queen Margaret of Navarre (1492-1549), the translations by Amyot (1513-1593) of Plutarch and other classic writers, and the celebrated political pamphlet *Satire Ménippée*. In poetry Clement Marot (1497-1544) gave a new elegance to the language in his epistles and epigrams. Pierre de Ronsard (1524-1585) and the other members of the celebrated *Pléiade*, Jodelle, Belleau, Du Bellay, and others, sought to enrich their native tongue by the introduction of classic words, constructions, and forms of verse. Du Bartas (1544-1590) and D'Aubigné (1550-1630) carried on the work of Ronsard. Mathurin Régnier (1573-1613) may be said to close this school of poetry. Malherbe (1556-1628), the creator of a new taste in literature, sacrificed everything to correctness. It was his school that set the example of the smooth but monotonous Alexandrine. With the Renaissance translations of the classic dramas appeared, and a member of the *Pléiade*, Jodelle (1532-1573), wrote the first regular tragedy (*Cléopâtre*) and comedy (*Eugène*).

The seventeenth century opened with Alexandre Hardy (1560-1631), Rotrou (1609-1650), Tristan (1601-1655), Mairet (1604-1688), Du Ryer (1605-1648), and a host of other dramatists. At length

Pierre Corneille (1606-1684), with his *Cid*, *Cinna*, *Horace*, and *Polyeucte*, brought French tragedy to a degree of grandeur which it has never surpassed. Of seventeenth-century prose writers Pascal (1628-1662) is vigorous and satirical in his *Lettres Provinciales*; profound, if sometimes mystical, in his *Pensées*. The letters of Balzac (1594-1654) and Voiture (1598-1648), though rhetorical, are good examples of polished prose. Descartes (1596-1650) showed in his *Discours sur la méthode* that the language was now equal to the highest philosophical subjects, and the great work of his disciple, Malebranche, *Recherche de la vérité*, is equally admirable for its elegance of style and its subtlety of thought.

The age of Louis XIV is known as the golden age of French literature. Besides Corneille, Racine (1639-1699) represented the tragic drama, and Molière (1622-1673) brought his great masterpieces of comedy on the stage. The 'inimitable' La Fontaine (1621-1695) produced his *Contes* and the most charming collection of fables. For his critical influence, if not for his poetry, Boileau (1636-1711) holds a prominent place. In eloquence the sermons and funeral orations of Bossuet, Bourdaloue, and Massillon take the first rank. Bossuet is also celebrated as a controversialist and theological historian. Very important, too, are the memoir and maxim writers of this time. Amongst the former are the Cardinal de Retz, Madame de Motteville, Madame de Sévigné (1627-1696), and others; amongst the latter are La Rochefoucauld (1613-1680), St. Evremond (1613-1703), and La Bruyère (1639-1699). In fiction Le Sage, who also wrote comedies, produced his immortal *Gil Blas* and the *Diable Boiteux*; and the versatile Fontenelle wrote his *Dialogues des morts*.

Amongst the writers of the eighteenth century Voltaire holds the first place. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712-1778), a writer of an eloquent sentimental vein, well represented by his *Nouvelle Héloïse* and his famous *Confessions*. His new theories of politics and education are embodied in his *Contrat Social* and *Émile*. Buffon (1707-1788) devoted himself to the production of his immense natural history. Montesquieu (1689-1755), commencing with the *Lettres Persanes*, a satire on French manners and government,

followed with an historical masterpiece, *Considérations sur la grandeur et la décadence des Romains*, and finally with his great work, the *Esprit des Lois*. Diderot (1713-1783), a powerful and suggestive writer in many departments, and D'Alembert (1717-1783), a great geometrician, founded the *Encyclopédie*, a vast review of human knowledge, often hostile to social order and always to religion. Amongst the philosophers Helvetius, D'Holbach, and La Mettrie represent the extreme materialistic and anti-Christian school. Condillac and Condorcet kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1737-1814), author of *Paul et Virginie*, and Prévost (1697-1763), author of *Manon Lescaut*, are particularly worthy of mention; while dramatic literature was enriched by the *Barbier de Séville* and the *Mariage de Figaro* of Beaumarchais (1732-1799). The most successful poet was Delille (1738-1813). André Chénier (1762-1794), the most promising of all, fell beneath the guillotine just after completing his *Jeune Captive*.

Neither the Revolution nor the First Empire was favourable to literature. Chateaubriand (1768-1848) and Madame de Staël (1766-1817) gave a new turn to the taste and sentiment of the time. Later on in the nineteenth century the influence of Goethe, Schiller, Shakespeare, Scott, and Byron began to be felt, and a new school, called the *Romantic*, as opposed to the old or *Classic*, sprang up, headed by Victor Hugo (1802-1885), who promulgated the new theories in the preface to his drama of *Cromwell*, and carried them into practice in numerous poems. The most notable of his associates were Alfred de Vigny (1797-1863), author of a volume of *Poèmes*, and of a novel, *Cinq-Mars*; Sainte-Beuve (1804-1869), who published several volumes of poetry in those early days, but became famous later on as a critic, perhaps the best France has ever possessed; and Alfred de Musset (1810-1857), who produced some of the finest lyrics in the language. Charles Nodier, Gérard de Nerval, the two Deschamps, and, later, Théophile Gautier, with others, also belonged to the band of romanticists. On the stage the dramas of Alexandre Dumas the elder (1803-1874), though melodramatic and of inferior literary value, served as

rallying points for the new school. To English readers, however, he is best known by his novels. A reactionary movement was attempted, led by Ponsard (1814-1867) and Émile Augier (1820-1889). Casimir Delavigne (1793-1843) attempted to combine the Classic and Romantic schools; and Lamartine (1790-1869) is more than half a romanticist by sentiment and style. Béranger (1780-1857), the greatest of French song-writers, may be considered as belonging to neither of the two schools.

Among novelists, Balzac (1799-1850), by his series of realistic novels, known by the comprehensive name of *La Comédie Humaine*, has established his claim to the first place. The novels of George Sand (Madame Dudevant, 1804-1876), are perhaps equally famous. Low life in Paris was vividly depicted by Eugène Sue (1804-1857) in the *Mystères de Paris*, &c. Of a healthy tone are the novels of Frédéric Soulié, Émile Souvestre, and Edmond About (1828-1885), and the stories of the two novelists, conjoined in work as in name, Erckmann-Chatrian. The younger Dumas, Victorien Sardou, Octave Feuillet, Ernest Feydeau, Henri Murger, and Gustave Flaubert developed a realistic style of novel. The chiefs of the later realistic school were Émile Zola, Guy de Maupassant, Émile Gaboriau, Victor Cherbuliez, Alphonse Daudet, &c.

In works of history the eighteenth and nineteenth centuries were very prolific, the leading historians being Michaud (1767-1839), Sismondi (1773-1842), Guizot (1787-1874), Amédée Thierry (1787-1873), Augustin Thierry (1795-1856), Mignet (1796-1884), Thiers (1797-1877), Michélet (1798-1874), Henri Martin (1810-1883), Victor Duruy (1811-1894), and Louis Blanc (1813-1882). Literary historians are: Villemain (1790-1870), Vinet (1797-1847), J. J. Ampère (1800-1864), Littré (1801-1881), St. Marc-Girardin (1801-1873), Sainte-Beuve (1804-1869), Taine (1828-1893), Demogeot, Fustel de Coulanges, Lavisse, and Sorel. Philosophy is represented by Lamennais (1782-1854), Victor Cousin (1792-1867), Jouffroy (1796-1842), Rémusat (1797-1875), Auguste Comte (1798-1857), Quinet (1803-1875), Montalembert (1810-1870), Renan (1823-1892), and in the twentieth century Fouillée, Bergson, and Boutroux. Among the writers on political economy and sociology are: Bastiat (1801-1850), Tocqueville (1805-

1859), Chevalier (1806–1879), Proudhon (1809–1865), Jules Simon (1814–1896), Prévost-Paradol (1829–1870), Letourneau, and Dürkheim. Among scientific writers are: Étienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, Duméril, in natural science; Gay-Lussac, Bichat, Corvisart, Magendie, Berthelot, and Le Chatelier in chemistry and medicine; and Lagrange, Laplace, Arago, and H. Poincaré in mathematics. Amongst Orientalists of note are: Champollion, Burnouf, Silvestre de Sacy, Stanislas Julien, Sylvain Lévi, Maspero, Opert, &c. The essayists and literary and art critics are legion. We can only mention by name Théophile Gautier, Jules Janin, Philarrète Chasles, Léon Gozian, Paul de St. Victor, Gustave Planche, and St. René Taillandier. Among more modern critics are: Brunetière, Doumic, Faguet, Larroumet, and Lanson. Amongst poets who belong to a date posterior to the Romantic movement, or show different tendencies, may be mentioned Gautier, who inaugurated the Parnassian school of poetry, and his disciples Banville and Baudelaire. Others were: Leconte de Lisle, François Coppée, Sully Prudhomme, Catulle Mendès, and the modern Provençal poets Frédéric Mistral and Théodore Aubanel. Paul Verlaine and Mallarmé, on the other hand, founded the Symbolist school of poetry. To the Symbolists belong the Belgians Maeterlinck, Verhaeren, and Rodenbach. Among more recent novelists are: Bourget, Bazin, Bordeaux, Barbusse, Anatole France, Pierre Loti, Marcel Prévost, Pierre Benoît, &c. Among dramatists we may mention: Brieux, Donnay, Henri Bataille, Henri Bernstein, and last, but not least, Edmond Rostand, poet and dramatist. Separate articles will be found on the more important writers.—BIBLIOGRAPHY: F. Brunetière, *Manual of the History of French Literature*; G. E. B. Saintsbury, *A Short History of French Literature*; E. Dowden, *A History of French Literature*.

Francesca da Rimini (thirteenth century), an Italian lady who was married to Lanciotto, or Sciancato, the deformed son of the Lord of Rimini. Lanciotto, discovering an intimacy between her and his brother Paolo, put them both to death. The story forms an episode in Dante's *Inferno*, and is alluded to by Petrarch; it is the subject of a poem by Leigh Hunt,

of a tragedy by Silvio Pellico, a dramatic poem by Stephen Phillips, and a drama by D'Annunzio.

Franche-Comté, an ancient province of France, forming at present the departments of Doubs, Haute-Saône, and Jura. It formed part of the Kingdom of Burgundy.

Franchet d'Esperey, Louis (1856–), French soldier. In 1918 he became supreme commander of the Allied armies in the Orient, and obtained the surrender of Bulgaria. Until 1920 he commanded the Allied armies in European Turkey.

Francia, José Gaspar Rodríguez (1758–1840), Dictator of Paraguay. In 1811, when Paraguay threw off the Spanish yoke, he became secretary of the Junta appointed by Congress. In 1814 he was appointed Dictator for three years, and in 1817 he was continued in authority for life. He did much to consolidate the new republic.

Francis I (1494–1547), King of France. He ascended the throne in 1515, having succeeded his uncle, Louis XII. On the death of Maximilian (1519) Francis was one of the competitors for the empire; but the choice fell on Charles of Austria, the grandson of Maximilian, henceforth known as the Emperor Charles V. From this period Francis and Charles were rivals, and were almost continually at war with one another. Francis met Henry VIII of England at the Field of the Cloth of Gold in 1520, but nothing of importance was decided there. In 1521 war broke out between the rivals, and in 1525 Francis was defeated and taken prisoner at Pavia. War was soon after renewed, an alliance, called the Holy League, having been formed between the Pope Clement VII, the King of France, the King of England, the Republic of Venice, the Duke of Milan, and other Italian powers, with the object of checking the advances of the emperor. In this war Rome was taken and sacked by the Constable of Bourbon (1527). Peace was concluded in 1529, but hostilities again broke out in 1535. After many vicissitudes a peace was concluded at Crespy in 1544. Charles resigned all his claims to Burgundy, and allowed Francis to retain Savoy. Two years after, peace was made with England.

Francis II (1544–1560), King of France, ascended the throne in 1559. The year



previous he had married Mary Stewart, only child of James V, King of Scotland.

**Francis I** (1708-1765), Emperor of Germany. In 1736 he married Maria Theresa, daughter of the Emperor Charles VI. After the death of Charles VII, he was elected emperor in 1745.

**Francis I** (1768-1835), Emperor of Austria (previously Francis II, Holy Roman Emperor). He succeeded his father, Leopold II, in 1792. France declared war against him in 1792, and hostilities continued till the Peace of Campo-Formio, 1797. In 1799 he entered into a new coalition with England and Russia against the French Republic; but in 1801 Russia and Austria were compelled to conclude the Peace of Lunéville. In 1805 war again broke out between Austria and France. But after the battle of Austerlitz (1805) the Peace of Presburg was signed. His daughter Maria Louisa married Napoleon I. In 1813 he entered into an alliance with Russia and Prussia against France, and was present to the close of the contest.

**Francis of Assisi, St.** (1182-1226), founder of the Order of the Franciscans. In 1208 he gave himself to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of eleven he formed them into a new order, made a rule for them, and got it sanctioned, though at first only verbally, in 1210 by Pope Innocent III. Francis afterwards obtained a Bull in confirmation of his order from Pope Honorius III. He was canonized by Pope Gregory IX in 1228. See *Franciscans*.—**BIBLIOGRAPHY:** Paul Sabatier, *Vie de St. François* (English translation by L. S. Houghton); Canon Knox-Little, *St. Francis of Assisi*; Stoddart, *Francis of Assisi*.

**Francis of Paola** (1416-1507), founder of the Minims. Charles VIII of France built him a monastery in the park of Plessis-les-Tours and another at Amboise, and loaded him with honour and tokens of veneration. Twelve years after his death he was canonized by Leo X.

**Francis of Sales** (1567-1622), Bishop of Geneva. His *Introduction à la Vie dévote* has been translated into all the leading languages of Europe. In 1665 he was canonized by Pope Alexander VII, and (1923) became patron saint of Christian writers.

**Francis Ferdinand** (1863-1914), Arch-

duke of Austria. A nephew of the Emperor Francis Joseph and the son of Archduke Charles Louis, he became heir-presumptive to the crown of the Dual Monarchy after the death of Prince Rudolf of Austria in 1889. He was assassinated at Sarajevo on 28th June, 1914, an event which precipitated the European War.

**Francis Joseph I** (1830-1916), Emperor of Austria and King of Hungary. He succeeded to the throne of the Dual Monarchy in 1848. During his long reign Francis Joseph not only saw the prestige of his House diminished, and Austria losing many of her possessions, but he also lived through a series of family tragedies. His only son, Prince Rudolf, met a violent death at Meyerling; his wife was assassinated at Geneva in 1897; his sister-in-law, the wife of Emperor Maximilian of Mexico, went mad after her husband's death. The climax came when, in June, 1914, the Archduke Francis Ferdinand, nephew of the emperor and heir to the throne, was murdered with his wife at Sarajevo, in Bosnia. Francis Joseph was to a great extent personally responsible for the European War, but he did not live to see the end and the downfall of the House of Habsburg. See *Austria; European War*.—**BIBLIOGRAPHY:** R. P. Mahaffy, *Francis Joseph: his Life and his Times*; F. Gribble, *Life of the Emperor of Austria*.

**Francis, Philip** (1700-1773), poet and dramatist. He is best known from his translations of Horace and other classic authors.

**Francis, Sir Philip** (1740-1818), English politician and pamphleteer. In 1773 he went to the East Indies, where he became a member of the Council of Bengal, and the constant opponent of Warren Hastings. He subsequently took a prominent part in the impeachment of Hastings. He published several political pamphlets. Francis is generally considered to have been the author of the *Letters of Junius*. See *Junius*.

**Franciscans**, the members of the religious order established by St. Francis of Assisi about 1210. They are also called Minorites, or *Fratres Minores* ('lesser friars'), which was the name given them by their founder in token of humility, and sometimes Grey Friars, from the colour of their garment. The order was distinguished by vows of absolute poverty

and a renunciation of the pleasures of the world, and was intended to serve the Church by its care of the religious state of the people. The rule of the order destined them to beg and to preach. The Popes granted them extensive privileges, and they had an evil repute as spies, frequenting the courts of princes and the houses of noblemen, gentry, &c. They appeared in Britain about 1220. Early in the fifteenth century the Franciscans split up into two branches, the Conventuals and the Observants or Sabotiers. The former went barefooted, wore a long grey cassock and cloak and hood of large dimensions, covering the breast and back, and a knotted girdle. The Observants wore wooden sandals, a cassock, a narrow hood, a short cloak with a wooden clasp, and a brown robe. In France the members of the order not belonging to any particular sect are called Cordeliers, from the cord which they tie about them.

**Franck**, César (1822-1890), French musical composer. He studied at Liège and Paris, and in 1872 succeeded Benoist as professor of the organ at the Conservatoire. His works include a Biblical cantata, *Ruth* (1846); *Les Béatitudes*, an oratorio (1870-1880); and the symphonic poems *Le Chasseur maudit* (1883) and *Psyche* (1888). Two operas, *Hulda* and *Ghiselle*, were produced posthumously.

**Francke**, August Hermann (1663-1727), German theologian and philanthropist. In 1695 he founded the famous orphanage at Halle still known by his name. His *Manuductio* (1693) was translated into English under the title of *A Guide to the Reading and Study of the Holy Scriptures* (1813).

**Franco-German War of 1870-1871.** See *France* (History).

**Francolin**, a genus of birds belonging to the same family as the partridge. The only European member of the genus, the *Francolinus vulgaris*, is found in the south of Europe generally; it is known in North India as the 'black partridge'. The other species belong to Africa, Asia, and Oceania. The 'redwing' (*F. levallanti*) of Cape Province is familiar to sportsmen.

**Franconia**, a district of Germany lying to the east of the Rhine, and traversed by the Main, formerly a Grand Duchy. In 1806 it was partitioned among Württemberg, Baden, Hesse-Cassel, the Saxon duchies, and Bavaria. The last received

the largest share, now forming the three divisions of Upper, Middle, and Lower Franconia, with a total area of 9194 sq. miles, and a population of 2,338,635.

**Frankenberg**, a German town, in Saxony, 40 miles south-east of Leipzig. It has extensive manufactures of woollens, cottons, and silks. Pop. 13,576.

**Frankenhausen**, a town of Germany, in Thuringia. It has great salt-mines and several salt-springs. Pop. 6600.

**Frankenstein**, the student hero of a tale by Shelley's second wife (1818). He constructed a monster from human fragments gathered in burial-grounds and dissecting-rooms. It wrought a dreadful retribution upon its maker. References to this monster under the name of its maker, Frankenstein, are popular in metaphor.

**Frankenthal**, a town in Bavaria, in the Palatinate, on a canal near the Rhine, 33 miles s.s.e. of Mainz. Ironfoundry and the manufacture of machinery are carried on, and there is a trade in linen, iron, and light beer. Pop. 18,779.

**Frankfort**, the capital of Kentucky, U.S.A., situated on the Kentucky River. It has an arsenal, sawmills, shoe and furniture factories, &c. Pop. 10,465.

**Frankfurt-on-the-Main**, a town of Prussia, in the province of Hesse-Nassau, 20 miles north-east of Mainz. It is mainly situated on the right bank of the Main, but has the suburb of Sachsenhausen on the left bank, the river being crossed by seven bridges (two for railways). Both banks of the river are lined by spacious quays. There are many interesting buildings, chief of which is the Römer or town house. In one of its halls the Electors of the empire met, and in another (the Kaisersaal) the emperor was banqueted after election. The most remarkable of the churches is the Dom or Cathedral of St. Bartholomew (Roman Catholic), in which the German emperors after 1711 were crowned. It is a Gothic edifice, begun in 1238. Frankfurt is rich in collections connected with literature and art. The chief of these are the Historical Museum, the Städel Art Institute, the Senckenberg Museum of Natural History, and the town library. The manufactures comprise chemicals, ornamental articles of metal, sewing-machines, straw hats, soap, perfumery, and beer. A large business is done in money and banking. The town

is a great railway centre, and is now reached by the largest vessels navigating the Rhine. Frankfurt dates from the time of Charlemagne. It was made an imperial free city by a decree of the Emperor Louis V in 1329. Frederick Barbarossa had been elected emperor here in 1152, and in 1356 the right of being the place of election for all future emperors was granted to it by the Golden Bull. Under Napoleon it became the capital, first of a principality, and then, in 1806, of a grand duchy. From 1814 to 1866 it was one of the four free cities of the German Confederation, and in 1866 it was taken by the Prussians. There is a Protestant university. Pop. (1925), 540,115 (60 per cent being Protestants).

**Frankfurt-on-the-Oder**, a town of Prussia, province of Brandenburg, on the Oder, 52 miles E.S.E. of Berlin. The manufactures consist of machinery and metal goods, chemicals, leather, earthenware, and spirits; and the trade is extensive both by land and water. Frankfurt was annexed to Brandenburg in 1250, and was always an important commercial place. Pop. (1925), 70,725.

**Frankincense**, a name given to the oleo-resinous exudations from different species of conifers. American frankincense is got as a soft, yellow, resinous solid, with a characteristic turpentine odour, from *Pinus Taeda*. Another kind is exuded by the spruce fir. The frankincense employed in religious ceremonies (called also *incense* and *olibanum*) is a gum-resin obtained from *Boswellia thurifera* (or *serrata*), a tree somewhat resembling the sumach, which grows amongst the mountains of India.

**Frankland**, Sir Edward (1825-1899), English chemist and authority on sanitation. He and Sir Norman Lockyer were the original discoverers of helium (in 1868). In 1877 he published a volume of *Experimental Researches in Pure, Applied, and Physical Chemistry*, a work on *Inorganic Chemistry* (with F. R. Japp, 1884), besides many other works and papers.

**Franklin**, Benjamin (1706-1790), American writer and politician. He was placed with his brother, a printer, to serve an apprenticeship to that trade. At the age of seventeen he started for Philadelphia, where he obtained employment as a compositor. In 1729 he printed a newspaper, *The Pennsylvania Gazette*,

which he managed with much ability. In 1732 he published his *Poor Richard's Almanack*, which continued to be issued till 1757. Being in Boston in 1746, he saw, for the first time, some experiments in electricity, which led him to begin those investigations which resulted in the identification of lightning and electricity, and the invention of the lightning-conductor. As member of the Provincial Assembly of Pennsylvania he showed himself very active, and he was sent out (in 1757) to the mother country as the agent of the province. His reputation was now such that he was appointed agent of the provinces of Massachusetts, Maryland, and Georgia. In 1762 he returned to America, but was again appointed agent in 1764. On his return he was elected member of the Congress, and exerted all his influence in favour of the Declaration of Independence. After the surrender of Burgoyne, he concluded with France the first treaty of the new states with a foreign power (1778). On his return to his native country he filled the office of President of Pennsylvania. His works include his unfinished *Autobiography*, and a great number of political, anti-slavery, financial, economic, and scientific papers.—**BIBLIOGRAPHY**: James Parton, *Life and Times of Benjamin Franklin*; J. B. McMaster, *Benjamin Franklin as a Man of Letters*.

**Franklin**, Sir John (1786-1847), English Arctic explorer. He entered the navy as a midshipman at the age of fourteen, and was present at Copenhagen (1801), Trafalgar (1805), and the attack on New Orleans (1814). His Arctic work began in 1819, when he conducted an overland expedition for the exploration of the north coast of America from Hudson Bay to the mouth of the Coppermine River. In a second expedition he surveyed the coast from the mouth of the Coppermine west to Point Beechy. He held the post of Governor of Tasmania from 1836 to 1843. In 1845 he took command of the *Erebus* and *Terror* in what proved his last polar expedition. At various times parts of the ships were found, and McIlintock, in 1859, discovered at Point Victory, in King William's Land, a document which had been deposited in a cairn. This paper stated that Sir John died 11th June, 1847; that the ships were abandoned in April, 1848; and that the crews, 105 in number, had started for the Great Fish

River. None survived, but many relics of the party were recovered.—Cf. H. D. Traill, *Life of Sir John Franklin*.

Franklin, a name given (from Sir John Franklin, the Arctic explorer) to one of three provisional districts of the North-West Territories of Canada which came into effect in 1920. It includes the islands lying north of the mainland, with Melville Peninsula and Boothia Peninsula.

Franklinite, a mineral composed of oxides of iron, zinc, and manganese, belonging to the group of minerals called *spinels*. It is used for the manufacture of spiegeleisen, and the zinc is recovered from the furnace gases.

Franzensbad, a watering-place in Bohemia, Czechoslovakia, about 3 miles north of Eger. The mineral springs are very efficacious, particularly in scrofulous and cutaneous affections. Pop. 1850.

Franz-Joseph Land, an island group in the Arctic Ocean, lying north of Novaya Zemlya, and consisting of two chief islands and a number of smaller ones.

Frascati, a town, Italy, about 10 miles south-east of Rome. It is much resorted to by the people of Rome in summer-time. Pop. about 10,500.

Fraser, Alexander Campbell (1819–1914), Scottish philosophical writer. He was professor of logic and metaphysics at Edinburgh from 1856 to 1891. His works include monographs on Locke and Berkeley, *Biography of Thomas Reid*, *Philosophy of Theism*, *Our Final Venture*, and *Berkeley and Spiritual Realism*.

Fraserburgh, a seaport of Scotland, in Aberdeenshire. It has a good trade, and is the chief seat of the Scottish herring-fishery. The new harbour has accommodation for vessels of 22 feet draught. Pneumatic-tool works have been established there. Pop. (1931), 9720.

Fraser River, the principal river in British Columbia, Canada, rising in the Rocky Mountains, and after a total course of about 500 miles falling into the Gulf of Georgia. Gold is found both on the Fraser and its affluents, and the salmon fisheries are important. Its principal affluents are the Thomson and Stuart Rivers.

Fraternity, a religious society for pious practices and benevolent objects. Such societies were often formed during the Middle Ages, from a desire of imitating the holy orders. Among them were the *Fratres Pontifices*, a brotherhood that

originated in Tuscany in the twelfth century, where it maintained establishments on the banks of the Arno, to enable travellers to cross the river, and to succour them in case of distress. Similar to these were the *Knights and Companions of the Santa Hermandad* (or *Holy Brotherhood*) in Spain; the *Familiares and Cross-bearers* in the service of the Spanish Inquisition; the *Calendar Brothers* in Germany; and the *Alexians* in Germany, Poland, and the Netherlands. There were also *Grey Penitents*; the black fraternities of *Mercy* and of *Death*; the *Red*, the *Blue*, the *Green*, and the *Violet Penitents*, so called from the colour of their cowl; the divisions of each were known by the colours of the girdle or mantle. The fraternity of the *Holy Trinity* was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from the hospitals.

Fratricelli, the name given about the end of the thirteenth century to wandering mendicants of different kinds, but especially to certain Franciscans. They claimed to be the only true Church, and denounced the Pope, whose authority they threw off, as an apostate. They made all perfection consist in poverty, forbade oaths, and eschewed marriage.

Fraud, an act or course of deception, deliberately practised with the view of gaining an unlawful or unfair advantage. Fraud is a generic term comprising both crimes and torts. In criminal proceedings the various crimes involving fraud are punishable by statute. The civil remedy for fraud is a suit for damages or for avoidance of transaction in which it is contained, and every species of fraud of which the law takes cognizance renders voidable every transaction into which it enters as a constituent material element. The director of a company may be held liable for fraud even if unauthorized by him the company has issued a fraudulent prospectus.

Fraunhofer, Joseph von (1787–1826), German optician. He is noted for his discovery of the innumerable dark fixed lines in the solar spectrum, known as *Fraunhofer's Lines*, a discovery of unique importance, which led to the invention and use of the spectroscope, to the science of spectroscopy, and to all our present knowledge of solar and stellar chemistry.

Fray Bentos, a town of Uruguay, on the River Uruguay, about 170 miles



north-west of Monte Video. It owes its existence to immense slaughter-houses, meat canneries, and establishments connected with the extract-of-meat trade. Vessels load up to 18 feet at the wharves. Pop. 10,000.

**Frazer**, Sir James George (1854– ), British classical scholar and anthropologist. He was knighted in 1914, and received the Order of Merit in 1925. His publications include: *Totemism; The Golden Bough: a Study in Comparative Religion* (1890; reissued in 12 volumes between 1907 and 1915; abridged edition, 1922); *Pausanias' Description of Greece; Pausanias and other Greek Sketches; Lectures on the Early History of the Kingship; The Scope of Social Anthropology; Totemism and Exogamy; Folklore in the Old Testament; The Worship of Nature* (1926); *Man, God, and Immortality* (1927); *The Fasti of Ovid* (1929); *Garnered Sheaves* (1931).

**Fréchette**, Louis Honoré (1839–1908), French Canadian author. He published collections of poems entitled *Mes Loisirs, Les Fleurs Boréales*, and *Les Oiseaux de Neige* (the two last crowned by the French Academy); the dramas of *Félix Poultré* (1862), *Papineau* (1880), *The Thunderbolt* (1882), &c.

**Fredericia**, a seaport of Denmark, in Jutland, at the north entrance of the Little Belt. The harbour is very safe and has a depth of 24 feet. The chief exports are cattle, grain, and dairy produce. Pop. 17,000.

**Frederick I**, Barbarossa (1121–1190), Roman emperor. He received the imperial crown in 1152. His principal efforts were directed to the extension and confirmation of his power in Italy. In his first expedition to Italy in 1154 he subdued the towns of Northern Italy, and then got himself crowned at Pavia with the iron crown of Lombardy (April, 1155), and afterwards at Rome by Pope Adrian IV with the imperial crown (June, 1155). Soon after his return to Germany the Lombard cities revolted, and Frederick led a second expedition into Italy (1158), and took Brescia and Milan. Other expeditions into Italy were made in 1161 and 1166, in the latter of which Frederick carried everything before him, and was even able to set up in Rome the Anti-Pope Paschalis III. He undertook, in 1174, a fifth expedition into Italy, but was totally defeated in the battle of Legnano on the 29th of

May, 1176. In 1188 he assumed the cross, and with an army of 150,000 men and several thousand volunteers set out for Palestine. After leading his army with success into Syria, he was drowned in crossing the River Kalykadnus.

**Frederick II** (1194–1250), Roman emperor. He remained under the guardianship of Innocent III till 1209, when he took upon himself the government of Lower Italy and Sicily. The imperial crown of Germany was worn by a rival, Otho IV, whose defeat at the battle of Bouvines opened the way to Frederick, and in 1215 he was crowned at Aix-la-Chapelle. In 1227 he undertook a crusade; but when he did reach the Holy Land he was able to effect nothing permanent. In 1237 he broke the power of the Lombard League by a victory at Corte Nuova in Lombardy. The remainder of his life was occupied with his troubles in Italy, and he died in the midst of his wars. He was one of the ablest and most accomplished of the long line of German emperors.

**Frederick II** (1657–1713), King of Prussia, son of the Great Elector. He succeeded his father as Elector of Brandenburg in 1688, became King of Prussia in 1700, and was all his reign bitterly opposed to France.

**Frederick II** (1712–1786), King of Prussia, known as Frederick the Great. He was the son of Frederick William I and the Princess Sophia Dorothea of Hanover, sister of George II of England. The death of his father raised him to the throne in 1740, and it was not long before he asserted the claims of the House of Brandenburg to a part of Silesia then held by Maria Theresa. But his proposals being rejected, he occupied Lower Silesia in Dec., 1740, defeated the Austrians near Mollwitz and at Czaslau (Chotusitz), and the first Silesian War was terminated by the peace signed at Berlin, 28th July, 1742, leaving Frederick in possession of Silesia. Soon the second Silesian War broke out, the result of which was equally favourable to Frederick. By the Peace of Dresden (15th Dec., 1745) he retained Silesia and acknowledged the husband of Maria Theresa, Francis I, as emperor. During the eleven following years of peace Frederick devoted himself to domestic administration. Secret information of an alliance between Austria, Russia, and Saxony gave him reason to fear an attack

and the loss of Silesia. He hastened to anticipate his enemies by the invasion of Saxony (1756), with which the Seven Years' War, or third Silesian War, commenced (see *Seven Years' War*). The Peace of Hubertsburg (1763) terminated this war, Frederick keeping Silesia and ceding nothing. On the partition of Poland in 1772 Frederick received a large accession to his dominions. In 1778 he frustrated the designs of the Emperor Joseph II on Bavaria, and the War of the Bavarian Succession was terminated without a battle by the Peace of Teschen (13th May, 1779). Frederick left to his nephew, Frederick William II, a kingdom increased by 20,000 sq. miles, a well-filled treasury, and an army of 200,000 men.—Cf. F. T. Kugler, *Life of Frederick the Great*.

Frederick III (1831–1888), Emperor of Germany. He succeeded William I 9th March, 1888. In 1858 he married the Princess-Royal of Britain, eldest daughter of Queen Victoria. In 1887 he was attacked by a serious throat affection, which turned out to be cancer, and which after a series of relapses proved fatal. He only reigned a hundred days.

Frederick VIII (1843–1912), King of Denmark. He was the eldest son of Christian IX, and succeeded to the throne of Denmark in 1906. His second son Charles became King of Norway in 1905, under the name of Haakon VII.

Frederick Augustus I and II, Electors of Saxony and Kings of Poland. See *Augustus II* and *III*.

Frederick Charles, Prince (1828–1885), Prussian general, known as the 'Red Prince'. He was nephew to the Emperor William I. Sadowa, Thionville, Gravelotte, and St. Privat are among his chief achievements.

Frederick William, of Prussia (1620–1688), generally called the *Great Elector*. At the age of twenty he succeeded his father as Elector of Brandenburg. He must be considered as the founder of the Prussian greatness. His reign began when the unhappy Thirty Years' War was still raging in Germany. He succeeded in freeing Prussia from feudal subjection to Poland; and obtained possession of Pomerania in 1648. In 1672 he concluded a treaty with the Dutch Republic. In 1674 the German Empire declared war against France. The Elector marched 16,000 men into Alsace, but a Swedish

army having been induced to invade Prussia, Frederick turned back and totally defeated them at Fehrbellin (1675). The Great Elector left to his son a country much enlarged and improved, an army of 28,000 men, and a well-filled treasury.

Frederick William I (1688–1740), King of Prussia. On his accession to the throne in 1713 he endeavoured to increase the army and reform the finances, and became the founder of the rigid discipline regarded as characteristic of Prussian troops. He left behind him an abundant treasury, and an army of about 70,000 men.

Frederick William II (1744–1797), King of Prussia. He succeeded his uncle Frederick the Great in 1786, and shared in the second partition of Poland.

Frederick William III (1770–1840), King of Prussia, son of Frederick William II. During his reign Prussia suffered much at the hands of Napoleon, and lost a large portion of territory, which, however, was recovered after the fall of Napoleon.

Frederick William IV (1795–1861), King of Prussia, son of Frederick William III. When he succeeded to the throne on the death of his father in 1840, his first proceedings were of a popular character. He soon, however, began to pursue a retrograde and absolutist policy. In 1857 his mind gave way, and he sank into a state of hopeless imbecility, which rendered it necessary to appoint his brother William regent of the kingdom. William afterwards succeeded him.

Fredericton, the capital of New Brunswick, Canada, on the River St. John, about 84 miles from its mouth. It is the centre of a lumbering area, coal, tungsten, and antimony are found in the vicinity, and there are various manufactures. The largest canoe- and boat-building establishment in the Empire is here. The trade is extensive and increasing, the river being navigable for large steamers. Pop. 8114.

Fredrikshald, a seaport, Norway, at the mouth of the Tistedal in the Iddefjord, about 60 miles S.S.W. of Oslo. Vessels drawing 20 feet can enter the harbour. The chief exports are wood, wood-pulp, pit-props, and paper. Pop. 11,149.

Fredrikshavn, a seaport of Denmark, in Jutland, on the Kattegat, with a large export of agricultural produce, its harbour (depth 22 feet) being much resorted to for shelter. Pop. 7916.

**Fredrikstad**, a seaport of Norway, 58 miles south-east of Oslo. It is a great timber centre, and exports pit-props, planks, nails, and chemicals. There is a shipbuilding yard. Pop. 15,563.

**Free Church of Scotland**, a Presbyterian Church organized as a separate body from the Established Church in May, 1843. The question of patronage had for many years caused friction between the ecclesiastical and the civil powers. The struggle was brought to an issue by the judgment of the House of Lords in 1842, affirming a decree of the Court of Session, which required the Presbytery of Auchterarder to induct the presentee to Auchterarder parish without regard to the dissent of the parishioners. In May, 1843, the members of the General Assembly had been elected and were convened at Edinburgh, when the Rev. Dr. David Welsh, who had been Moderator of the last Assembly, and other members of Assembly, together with those adhering to them, withdrew to another place of meeting (the Tanfield Hall, Canonmills), and constituted themselves the Free Church of Scotland. They elected Dr. Chalmers as their Moderator. The deed of demission, or resignation of livings, was signed by 474 ministers and professors. A sustentation fund was instituted for the maintenance of the ministers, to be supplied by the voluntary offerings of the people. In the first year after the disruption the sum of £366,719 was contributed for the erection of churches, between 700 and 800 of which had to be provided for congregations which left the Establishment with their ministers. Colleges for the theological training of the ministry were subsequently erected in Edinburgh, Glasgow, and Aberdeen. In 1900 the Free Church joined the United Presbyterian Church (established in 1847 on the voluntary principle), to form the United Free Church of Scotland. A small minority of Free Church ministers and members, who were nicknamed the 'Wee Frees', refused to accept the union and claimed to be the true Free Church of Scotland, a claim which the law decided in their favour. In 1905, however, an Act of Parliament, The Churches (Scotland) Act, was passed, under which an Executive Commission was set up for the purpose of allocating the property in proportion to

the number of adherents.—**BIBLIOGRAPHY:** A. M. Stewart, *Origins of the United Free Church in Scotland*; Peter Bayne, *The Free Church of Scotland*.

**Freedom of the City.** Since an Act of 1882 a burgess is a man (or woman) of full age who has occupied a house, resided for a year in the borough, paid poor and borough rates, and had his name recorded on the Burgess Roll. Freedom of a city may also be acquired by a formal gift, and it is in this connexion that the phrase is largely used, it being a common custom for London and other towns, both in England and Scotland, to bestow the privilege on eminent men and (since 1899) women. The Burgess Roll of an English borough has its Scottish equivalent in the Register of Municipal Electors.

**Freedom of the Seas.** By international consent a three (or sometimes four) mile limit of territorial sovereignty over the seas adjacent to any country is now admitted. The use of the open sea by any nation in time of peace is taken for granted, and the phrase 'freedom of the seas' in modern conversational usage is always understood to refer to time of war. Under conditions of war, a belligerent Power not only attempts to close the seas against its enemies, but also, for certain purposes, against neutrals. All enemy shipping is recognized by international custom to be liable to destruction or seizure, and no distinction is drawn between purely commercial shipping and ships of war, or between cargoes useful for military purposes and other classes of goods; the only limits to belligerent action in this respect are those imposed by considerations of humanity. In regard to neutrals, a belligerent Power claims the right to stop neutral vessels to search them, to confiscate goods likely to assist the military purposes of the enemy (contraband of war), and even to confiscate vessels which can be proved to be employed in the enemy's behalf, provided that the lives of crews and passengers are preserved. The position of Great Britain as a maritime Power has rendered it necessary, from time to time, to insist upon the legality of these principles, and the assertion of them has sometimes brought about the conversion of neutrals into enemies. In 1780 Russia, Denmark, Sweden, Prussia, and Austria formed an

'Armed Neutrality' against Great Britain in order to establish a rule that "a Power at war has no right to interrupt the commerce of the subjects of a neutral Power". The question again became important in the course of the great French war, and in 1800 Russia, Sweden, Denmark, and Prussia formed the second Armed Neutrality, which aimed at compelling Great Britain to recognize 'the freedom of the seas'; but the murder of the Tsar Paul and the battle of Copenhagen put an end to the League. In the later stages of the war, Napoleon justified the prohibition of trade with Great Britain by his Berlin and Milan decrees as a policy of retaliation against British interference with the freedom of the seas, and the enforcement of the blockade by the British Orders in Council led to the war of 1812-1814 with the United States. In the course of the nineteenth century, the general principles of the right of search by belligerent Powers and of the seizure of contraband goods came to be accepted as a rule of international law. In the European War of 1914-1918, the Germans revived the cry of the 'freedom of the seas', but with little attempt to disguise the fact that their real aim was to establish a German maritime predominance. In their conduct of the naval war, they deliberately violated international law in two respects. They destroyed enemy merchant vessels without securing the safety of the crews and passengers, and they attacked neutral vessels. The defeat of the Central Powers has disposed of the inhuman contentions of the former German Government, and the general question of the rights of belligerents at sea is one of the matters on which the League of Nations has power to legislate.

**Freehold**, in law, an estate in real property, formerly held either in fee-simple or fee-tail, in which case it is a freehold of inheritance, or for the term of the owner's life. Now all land is freehold, and the only freehold estate is an estate in fee-simple.

**Freeman**, Edward Augustus (1823-1892), English historian and archaeologist. In 1884 he became regius professor of modern history at Oxford. His works, which are very voluminous, include: *History and Conquests of the Saracens* (1856), *Growth of the English Constitution* (1872), *History of the Norman Conquest* (1867-

1876), *The Reign of William Rufus* (1882), and *History of Sicily* (unfinished, 1891-1892).—Cf. W. R. W. Stephens, *Life and Letters of E. A. Freeman*.

**Freemasonry** has been defined as "a peculiar system of morality, veiled in allegory and illustrated by symbols". Fable and imagination have traced back the origin of freemasonry to the Crusaders and the Rosierucians, to the Roman Empire, to the Pharaohs, the temple of Solomon, the Tower of Babel, and even to the building of Noah's ark. In reality freemasonry took its rise in the Middle Ages along with other incorporated crafts. Skilled masons moved from place to place to assist in building the magnificent sacred structures—cathedrals, abbeys, and churches—which had their origin in these times, and it was essential for them to have some signs by which, on coming to a strange place, they could be recognized as real craftsmen and not impostors. Freemasonry in its modified and more modern form dates only from the seventeenth century. In 1717 the First Grand Lodge was established in London. The modern ritual is said to have been partly borrowed from the Rosierucians and knights templars, and partly devised by Elias Ashmole, the founder of the Ashmolean Museum. Freemasonry, thus modified, soon began to spread over the world. In 1725 it was introduced into France by Lord Derwentwater; and in 1733 the first American lodge was established. In ordinary freemasonry there are three grades—those of apprentice, fellowcraft, and master-mason—each of which has its peculiar initiatory ceremonies; the last of these grades, however, is necessary to the attainment of the full rights and privileges of brotherhood.—**BIBLIOGRAPHY:** R. F. Gould, *History of Freemasonry* and *A Concise History of Freemasonry*; Meredith Sanderson, *An Examination of the Masonic Ritual*.

**Free Port**, a port at which no customs or other dues are levied on imports. Singapore and Hongkong are of this class, though in most cases the bonded warehouse system has been substituted. In several ports, Copenhagen for example, there is a free port where goods for transshipment to some other country or port are landed. The free ports of China are simply ports which are open to traders and shipping of all nationalities.



**Freeport**, a city of Illinois, U.S.A., with manufactures of machinery and carpets. Pop. 19,669.

**Free-soil Party**, a political organization formed (1847-1848) in the United States, was recruited largely from the Abolitionist, Anti-Slavery Whig, and New York Democratic parties; its purpose was to oppose the introduction of slavery into the territories. The party nominated for the respective offices of President and Vice-President, Martin Van Buren and Charles Freeman Adams, and returned two Senators and fourteen representatives to the thirty-first Congress. In 1854 the 'Free-soilers' became absorbed in the Republican party.

**Free-thinkers.** See *Rationalism*.

**Freetown**, a seaport, West Africa, capital of the British West African colony of Sierra Leone, near the mouth of the estuary or river of Sierra Leone, in the vicinity of extensive swamps. It has a good harbour, and is an Imperial coaling-station. Pop. 44,142. See *Sierra Leone*.

**Free-trade**, the principle under which international commerce is freed from every form of Government manipulation, such as tariffs, bounties, or restrictive legislation in the interest of particular classes of producers. Until 1846 the body of British commercial legislation was based on the theory of protection (q.v.). The battle for free-trade in the United Kingdom was fought over the Corn Laws of 1815, 1822, and 1828, and by the National Anti-Corn Law League (founded 1839), in which the moving spirits were before all Richard Cobden and John Bright. The Corn Laws were repealed in 1846, and the repeal of the Navigation Laws followed in 1849, and the last protective duties were removed by Gladstone in 1853 and 1860. The first breach in Britain's seventy years' fidelity to free-trade was made in 1915, on the plea of discouraging 'luxury' imports during the European War. In 1920 the Dyestuffs (Import Regulation) Act was passed, prohibiting for ten years the import of synthetic organic dyestuffs and intermediate products used in their manufacture. In 1921 the Safeguarding of Industries Act was passed, under which all articles belonging to industries scheduled as 'key' industries are subjected to a duty of 33½ per cent (imports from the Empire being exempted). Industrial depression in 1930 caused consider-

able agitation by some people for protective tariffs, and by others for free trade within the Empire. Small states dependent on external commerce, as are Belgium and Holland, Norway and Denmark, are bound to follow a free-trade policy. — **BIBLIOGRAPHY:** Adam Smith, *The Wealth of Nations*; C. F. Bastable, *The Theory of International Trade*; J. M. Robertson, *Free Trade*; J. H. Higginson, *Tariffs at Work*.

**Free-will.** Since time immemorial man believed that he possessed a certain power to determine his actions. Vaguely he felt this power, but he only began to speculate on this question later on. To the ancient Greek philosophers the problem of free-will did not as yet present itself very clearly. The Eleatics, Socrates, Plato, and Aristotle did not discuss the problem in the way in which it is looked upon by modern philosophers. The Stoics were determinists, i.e. opponents of the theory of free-will, whilst Epicurus advocated the idea of free-will or indeterminism. It was, however, with the advent of Christianity that the problem of free-will assumed a new aspect. The Schoolmen invented the term of *liberum arbitrium*, and discussed its extent and limits. Whilst the Greek and Roman philosophers, the Fathers of the Church, the Schoolmen, and the Scholars of the Reformation based their arguments upon reason, modern philosophers and psychologists argue from the point of view of experimental psychology. On the one hand, it must be admitted that if the word morality is to have any meaning at all, man must be free and responsible for his acts; duty, obligation, remorse, and responsibility would otherwise become empty words. If man's actions are determined by an external force, acting independently of him, he cannot be held responsible for his actions. On the other hand, psychology teaches us that mental life is made up of a series of mental phenomena. Every state of mind stands in relation to some other phenomenon; in other words, the phenomena of inner life, like those of external nature, are explained by the law of cause and effect. A man is moved to act by certain motives, but these motives themselves are the result of certain external influences as modified by character, which, in its turn, is the result of previous acts, either of the individual or of his ancestors. The vexed

question of free-will is still a subject of controversy.—BIBLIOGRAPHY: W. James, *Principles of Psychology*; A. Bain, *The Emotions and the Will*; J. Ward, *The Realm of Ends*; H. Bergson, *Time and Free Will*.

**Freezing, or Solidification**, the changing of a liquid into a solid. Substances which are crystalline when solid undergo the change from the liquid state at a definite temperature, called the freezing-point. Other substances, such as wax, have no unique temperature of solidification, but gradually become solid while cooling through a certain range of temperature. While solidifying, a substance undergoes a change of volume, and gives out latent heat. The range of freezing-point temperatures is very wide, varying from that of helium, below  $-270^{\circ}\text{C}$ ., to tungsten, which melts about  $3300^{\circ}\text{C}$ .; carbon is supposed to melt about  $4000^{\circ}\text{C}$ . In most cases the change from liquid to solid is accompanied by a diminution of volume, but water is one notable exception to the rule. When pressure is applied to a substance, it affects the temperature of solidification. If a substance contracts on solidifying, an increase of pressure raises the freezing-point. The freezing-point of water is lowered  $1.13^{\circ}\text{C}$ . by a pressure of 1 ton per square inch. Water and other liquids may be cooled below their normal freezing-points without freezing if all air is removed and vibration is prevented. Water which contains a dissolved salt freezes at a lower temperature than pure water; sea-water freezes at  $-4^{\circ}\text{C}$ . The greater the amount of salt dissolved, the more is the freezing-point lowered.

As a general rule, solids when dissolved in water cause a fall of temperature. This is the case with common salt, and when snow is substituted for water, the salt dissolves to form a liquid and there is a marked fall of temperature. *Freezing mixtures* are made by mixing together two or more substances which form a solution at a temperature below zero. If equal weights of salt and snow are mixed together, a liquid is formed which has a temperature of about  $-20^{\circ}\text{C}$ .; when four parts of calcium chloride are mixed with three parts of snow, the liquid formed falls to about  $-50^{\circ}\text{C}$ . Such mixtures are employed to obtain low temperatures for laboratory experiments.

The Carré ammonia apparatus is a *freezing-machine* which produces cold by evaporation. Ammonia gas is freed, by heat, from a strong aqueous solution of ammonia, and led to a closed vessel containing another vessel with the water to be frozen, where it is condensed. When, after cooling, the liquid ammonia is evaporated, the gas abstracts latent heat from the water, which is thus frozen. Much greater cold can be produced by the evaporation of liquid air. See *Liquefaction of Gases*.

**Freiberg**, a German mining town, the centre of the mining district of Saxony, 20 miles w.s.w. of Dresden, near the Mulde. The Freiberg district yields silver, copper, lead, and cobalt. Pop. 32,981.

**Freiburg**, a town of Baden, on the Dreisam, 42 miles s.s.e. of Strassbourg. The chief buildings are the cathedral; the Ludwigskirche; the university, founded in 1456; the museum, and theatre. The manufactures are numerous. Pop. (with suburbs) (1925), 90,475.—The district of *Freiburg* has an area of 1830 sq. miles, and a population of (1925) 599,998.

**Freising**, a town of Bavaria, on the left bank of the Isar, 21 miles n.n.e. of Munich. Brewing, printing, and the making of agricultural machinery are carried on. Pop. 14,946.

**Fremantle**, Sir Edmund Robert (1836–1929), British admiral. He was Commander-in-Chief in the East Indies from 1888 to 1891, in China from 1892 to 1895, and at Plymouth from 1896 to 1899. He published an *Essay on Naval Tactics* (1880) and *The Navy as I have known it* (1905).

**Fremantle**, the chief seaport of Western Australia, at the mouth of the Swan River, 12 miles from Perth, with which there is communication both by rail and river-steamer. The harbour is large and well equipped, and there is accommodation for the largest vessels. The manufactures include aerated waters, boots, soap, furniture, and confectionery. A great deal of wheat is exported. Pop. 25,534.

**French**, John Denton Pinkstone, Earl of Ypres. See *Ypres*, *Earl of*.

**French Beans, or Kidney-beans**, the *haricots* of the French, are the products of the *Phaseolus vulgaris*, commonly cultivated in all parts of the globe. This plant is a twining annual, bearing alternate leaves, on footstalks, composed of

three oval pubescent folioles. The flowers are whitish, and the seeds are more or less kidney-shaped. Many varieties are cultivated.

**French Chalk**, scaly talc, a massive variety of talc, composed of small scales of a pearly-white or greyish colour: much used by tailors for drawing lines on cloth, and for similar purposes.

**French Colonies**. See list under *Colony* and consult separate articles.

**French Equatorial Africa**, an African territory bounded on the south and east by the Rivers Congo and Ubangi and by the Anglo-Egyptian Sudan, on the north by the Sahara, and on the west by the Cameroons (part of which is now included in French Equatorial Africa), Rio Muni, and the Atlantic; total area, 982,049 sq. miles; pop. 2,845,936. In 1910 the French Congo was divided into three colonies, Gabon, Middle Congo, and Ubangi-Shari (including Chad Territory), and the name was changed to French Equatorial Africa. In 1911 France ceded parts of the colony to Germany, but received them back in 1919. In 1920 the Chad territory was separated from the Ubangi-Shari and erected into a colony. The chief rivers are the Gabon, Ogowe, and Kwilu, and the principal stations are Libreville (the capital), Brazzaville, Njola, and Loango. In spite of the fact that the region is very unhealthy, a considerable trade is carried on in caoutchouc, cocoa, coffee, ivory, ebony, mahogany, palm-oil, &c. The natural resources of the colony are comparatively undeveloped; there are great forests awaiting exploitation, and lack of adequate means of transport is a serious drawback. Each colony has a Lieutenant-Governor under the Governor-General, who resides at Brazzaville. Every colony, too, has an administrative council and a separate budget, though there is a general budget for French Equatorial Africa. Railway mileage is about 2366 miles.—Cf. F. W. H. Migeod, *Across Equatorial Africa*.

**French Guiana**. See *Guiana, French*.

**French Guinea**. See *Guinea, French*; *French West Africa*.

**French Honeysuckle** (*Hedysärum coronarium*), the name of a leguminous plant, a common perennial in gardens, where it is grown for the sake of its beautiful scarlet flowers.

**French India**, a number of small French settlements in India, the chief of

which is Pondicherry (q.v.). They are divided into five colonies, Pondicherry, Karikal, Chandernagore, Mahé, and Yanam; total area, 196 sq. miles; pop. 272,427. The annual value of exports is c. 45,000,000 francs. Pondicherry was founded in 1674, and has been in English hands several times. The present position of French India was established by treaties in 1814 and 1815.

**French Indo-China**. See *Indo-China* and articles there indicated.

**French Language and Literature**. See *France*.

**French Polish**, a solution of shellac in alcohol, used for giving a smooth surface-coating to furniture and cabinet-work. The most common of the varnishes known under the name of French polish are prepared as follows: pale shellac, 5½ ounces; finest wood-naphtha, 1 pint; dissolve. Or pale shellac, 3 lb.; wood-naphtha, 1 gallon.

**French Revolution**. See *France*.

**French Somaliland**. See *Somaliland*.

**French Sudan**, till 1920 **Upper Senegal-Niger**, a French West African colony formed in 1904 by joining Senegambia, Niger, and the military territory of Timbuktu. In 1919 the southern part became the separate colony of Upper Volta (q.v.). The area is 360,331 sq. miles, and the pop. 2,500,000 (1037 whites). The Zinder-Chad Territory of the French Sudan has been since 1923 an autonomous unit. The colony is entirely inland, and is traversed by the Senegal and the Niger. Cotton, maize, rubber, and gums are produced. A railway runs from Bamako to Dakar (Cape Verde). The towns are Bamako (the capital), Segou, Kayes, and Timbuktu.

**French West Africa**, a vast region belonging to France, and comprising Senegal, the Colony of the Niger, French Guinea, the Ivory Coast, the Upper Volta Colony, the territory of Mauritania, French Sudan, and Dahomey. It extends from the Atlantic to Lake Chad, where it meets the hinterland of the French Congo. The limits of French influence have been partly defined by conventions arranged with Great Britain in 1890, 1898, 1904, and 1906. The delineation of the boundary was completed in 1912, and approved by the French and British Governments in 1914. The whole is under a Governor-General,

whose seat is the rising port of Dakar, connected by railway with St. Louis. In the interior are Kayes, Bafoulabé, and Bamakou (connected by a railway), Timbuktu, and Jenné. Area, about 1,800,566 sq. miles; pop. 12,283,917. See separate articles on the various colonies, and *Togoland*.

**Frere, Sir Henry Bartle Edward** (1815-1884), British statesman and administrator. He entered the East India Company's civil service in 1833. From 1847 to 1850 he was Resident at Sattara, and at the latter date succeeded Sir Charles Napier as Chief Commissioner at Scinde. He rendered valuable services during the Mutiny. He returned to England in 1867. In 1872 he negotiated a treaty with the Sultan of Zanzibar, abolishing the slave-trade in that ruler's dominions. He became Governor of the Cape and first High Commissioner of South Africa in 1877, but was censured by the Government, and recalled in 1880.

**Frere, John Hookham** (1769-1846), British diplomatist and author. He is now chiefly remembered as one of the writers in the *Anti-Jacobin*. His translations in verse of some of the comedies of Aristophanes are spirited but too full of doggerel rhymes, and are quite superseded by the version of B. B. Rogers (q.v.). He entered Parliament in 1796, and succeeded Canning as Under-Secretary for Foreign Affairs in 1799. From 1818 to 1819 he acted as British Ambassador in Spain, and subsequently held other diplomatic posts in Portugal and Prussia.

**Fresco Painting**, a method of mural painting in water-colours on wet and caustic grounds of lime. Minerals or earth pigments are employed, which resist the chemical action of lime. In drying, as the plaster absorbs carbonic acid from the air and hardens, the colours are incorporated with the plaster, and are thereby rendered as permanent as itself. The art is very ancient, remains of it being found in Crete, Egypt, India, Greece, and Mexico. Examples of Roman frescoes are found in Pompeii and elsewhere. After the beginning of the fifteenth century fresco painting became the principal process used by the greatest Italian masters, until it was displaced by the use of oil paint. Fresco painting has in recent years again been revived, and works of this kind have

been executed in the British Houses of Parliament and other public and private buildings, especially in Germany. See *Painting*.

**Fresnel, Augustin Jean** (1788-1827), French physicist. He did more perhaps than any other man to establish the undulatory theory of light, elucidated the phenomena of interference, diffraction, and polarization, and greatly improved the illuminating apparatus of lighthouses.

**Fresnillo**, a city, Mexico, state of Zacatecas. In its vicinity are celebrated silver- and copper-mines. Pop. 15,150.

**Fresno**, a town of the U.S.A., in California, in a great irrigation district, with important fruit, corn, and wine industries. Petroleum is found in the vicinity. Pop. 45,086.

**Freud, Sigmund** (1856- ), Austrian physician and psychologist. His contributions to science are a new method for the analysis and treatment of hysteria, called psychoanalysis, and a theory of dreams (q.v.). His works include: *Interpretation of Dreams* (1913), *Psychopathology of Everyday Life* (1901 and 1914), *Three Contributions to the Theory of Sex* (1905 and 1918), and *Totem and Taboo* (1913 and 1919). See *Psychotherapy*.

**Freya**, in the northern mythology, the sister of Frey and the daughter of Njörd, and often confounded with Frigga (q.v.).

**Freycinet, Charles Louis de Saulces de** (1828-1923), French statesman. He was Minister of Public Works in 1877, and Minister for Foreign Affairs 1877-1879. He was Premier four different times between 1879 and 1890, as also War Minister several times (last in 1898). He is the author of important works on engineering.

**Friar**, a name especially given to members of the four mendicant orders, viz. (1) Minors, Grey Friars, or Franciscans; (2) Augustines; (3) Dominicans or Black Friars; (4) White Friars or Carmelites. See *Augustins*, *Carmelites*, *Dominicans*, *Franciscans*.

**Fribourg**, a canton of Switzerland, surrounded by the cantons of Berne and Vaud, except a narrow part which touches the Lake of Neuchâtel. The southern part is mountainous, the northern part more level. Area, 644 sq. miles; pop. 143,055, of whom the great majority are Roman Catholics speaking French.

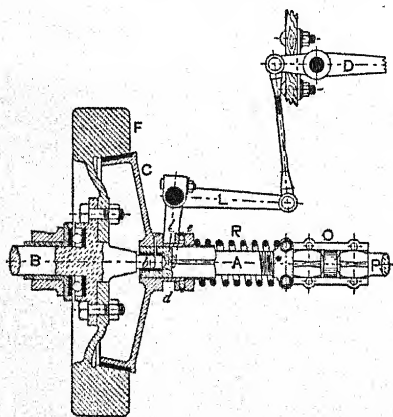
**Fribourg**, capital of the above canton, is situated on the Saane, 17 miles south-



west of Berne. The Gothic church of St. Nicholas contains one of the finest organs in Europe. Tobacco and pasteboard are manufactured. Pop. 20,400.

**Friction**, a force which is brought into play when one body moves or tends to move over another. It always acts as a resistance to motion; when it prevents motion, it is called static friction; when slipping takes place, it is known as kinetic friction. Static friction may have any value between zero and a maximum which is reached just before slipping takes place, and which is called limiting friction. Friction is proportional to the normal or perpendicular pressure between the two surfaces in contact, and the ratio of the friction force to the normal pressure is called the coefficient of friction. Friction is independent of the area of the rubbing surfaces, and when motion takes place, the friction is independent of the speed of slipping, except for very low speeds.

**Friction Clutch or Coupling**, a device by which a constantly rotating shaft gradually communicates its motion, without shock, to a driven part. The illustration



Motor-car Conical Clutch

D, The pedal lever. L, Bell-crank lever. b, Reduced end of the engine shaft B. R, Clutch-spring which is compressed by depressing the lever D, and so disengages the clutch C from frictional contact with fly-wheel F; on release of D the spring R moves C back to its working position. d, Collar by pressure on which the fork I withdraws the clutch C. e, Ball-bearing to take thrust of L. A, Clutch-shaft connected with primary shaft P by split-coupling o.

shows such a clutch arranged for a motor-car.

**Friendly Islands**, or **Tonga Islands**, a cluster in the South Pacific Ocean, situated about 400 miles south-east of the Samoan group. They consist of three groups, Tongatabu, Haapai, and Vavau, which are divided from each other by two narrow channels, and number altogether about 150, with a collective area of about 385 sq. miles. The largest island is Tongatabu, in the south group, which contains the capital, Nukualofa. The islands are nearly all volcanic, with coral reefs and rocks about them; earthquakes and volcanic eruptions are frequent. These islands were discovered in 1643 by Tasman, but received their collective name from Cook. They are governed by a native Christian prince under British protection. The trade is considerable, the chief exports being copra (13,506 tons, valued at £209,009 in 1922) and fruit. The natives are all Christians, principally Methodists, and education is free. Pop. 23,562.

**Friendly Societies**, societies formed for the mutual advantage of the members, and based on the principle that it is by the contribution of the savings of many persons to one common fund that the most effectual provision can be made for casualties affecting, or liable to affect, all the contributors. Mutual provident associations taking the Friendly Society form may be grouped under five heads: (1) *Affiliated Societies*; (2) *Ordinary Societies*, subdivided into (a) Centralized or General Societies, (b) Peculiar Trade and Profession Societies, (c) Local, including Dividing Clubs, (d) Societies of Women; (3) *Collecting Societies*; (4) *Medical Societies*; and (5) *Other Societies* registered under the Friendly Societies Act, including (a) Cattle Insurance Societies, (b) Benevolent Societies, (c) Working Men's Clubs, and (d) Specially Authorized Societies, i.e. those existing for purposes to which the Treasury specially extends any of the provisions of the Act. Divisions (1) and (2) offer a sickness as well as a funeral benefit to their members, and some of them offer a deferred annuity or superannuation as an optional benefit in addition. Each registered society or branch must have a registered office, and each society must send annually to the Registrar of Friendly Societies a return of income and expendi-

ture, and assets as audited. Every five years the financial condition of societies is inquired into and a report made by a valuer. The funds are guarded against maladministration or fraud, and facilities for the prosecution of the offender or offenders given. The Friendly Societies Act of 1896 consolidated the law on the subject, and was supplemented in some ways by the Collecting Societies and Industrial Assurance Companies Act of the same year. Of the Societies registered under the Friendly Societies Act the total number of members given in the general summary for 1927-1928 was for 1928, 7,495,000, and the funds amounted to £100,049,000.

The affiliated societies (or orders as they are called) are found among almost all English-speaking peoples, and to some degree occupy the position of the old craft guilds. The two wealthiest and largest are the Independent Order of Oddfellows (Manchester Unity), and the Ancient Order of Foresters. Other Orders are the Loyal Order of Ancient Shepherds (Ashton Unity), Druids, Rechabites, Free Gardeners, Sons of Temperance, Romans, &c. The three prime necessities for securing financial stability and efficient government are: (1) Registration, (2) Valuation, (3) Graduation. This last refers to the adoption of a graduated scale of annual contribution according to age on joining.

**Friends, Society of**, commonly known as **Quakers**, a society of Christians which took its rise in England about the middle of the seventeenth century. George Fox, a native of Drayton, in Leicestershire, was the first to teach the religious views which distinguish the society. He commenced his ministerial labours in 1647. Among the other eminent members of the society in its early days we may mention William Penn, Robert Barclay, George Whitehead, Stephen Crisp, Isaac Pennington, John Crook, Thomas Story, &c. The early Quakers were marked as a peculiar people by their testimonies against oaths, a paid ministry, and tithes; their use of the singular pronouns when addressing only one person; their refusal to take off the hat as a compliment to men; the plainness of their apparel; and their disuse of the ordinary names of the months and days. But, as in other reforming sects, so among the Quakers, success

in the course of time gradually undermined their zeal, and deprived them of many of their characteristic qualities. About the year 1827 Elias Hicks, a native of the state of New York, created a schism in the society by promulgating opinions denying the miraculous conception, divinity, and atonement of Christ, and also the divine authority of the Scriptures. About half the sect in America followed Hicks, and have since been known as the Hicksite Friends. The schism made much stir among Quakers in Great Britain as well as in America, and a movement was begun in favour of higher education, and of a relaxation in the formality of the society. This movement, headed by Joseph John Gurney, of Norwich, was strenuously opposed by a body of Quakers in America, and the result was a division among the Orthodox Friends themselves, and the origin of a new sect, known as Wilburites, from John Wilbur, its founder. There are about 19,000 members and adherents in Britain, about 100,000 in the United States and Canada, besides small numbers in other countries.—**BIBLIOGRAPHY:** J. Besse, *The Sufferings of the Quakers*; T. E. Harvey, *The Rise of the Quakers*.

**Friern Barnet**, an urban district in North Middlesex, England, 3 miles south-east of Barnet. Pop. (1931), 23,081.

**Fries**, Elias Magnus (1794-1878), Swedish botanist. He devised a natural system of classification, based on morphology and biology, which differs in many respects from those of Jussieu and Decandolle.

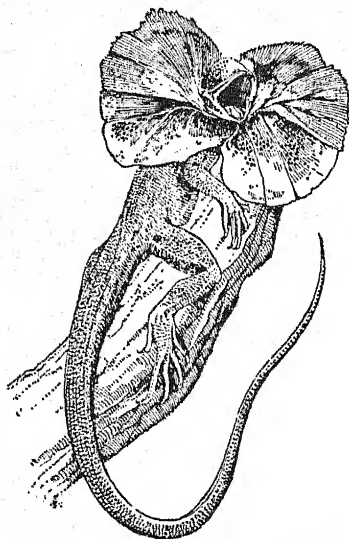
**Friesland**, the most northerly province of Holland. It is generally flat, and parts of it are below sea-level. The area is 1243 sq. miles, four-fifths of which are under cultivation. Leeuwarden is the capital. Pop. 390,384. See *Frisians*.

**Frigate-bird**, or **Man-of-war Bird** (*Fregata aquila*), a tropical web-footed bird, the type of a family (Fregatidae) allied to the pelicans. It is about 3 feet long, and has a very small body in proportion to the extreme length of its wings and tail. Its flight is both graceful and powerful.

**Frigga**, or **Frigg**, in northern mythology, the wife of the god Odin. She is a goddess in some respects corresponding with Venus, and is often confounded with Freya (q.v.).

**Frilled Lizard**, an Australian lizard,

*Chlamydosaurus Kingii*, so called from a curious membrane-like ruff or tippet round its neck.



Frilled Lizard (*Chlamydosaurus Kingii*)

Frishes-Haff, an extensive lagoon of Prussia, on the Baltic, from which it is separated by a long and narrow line of low gravel and sand-banks called the Frische-Nehrung.

Frisian Islands, the island chain stretching from North Holland to the mouth of the Weser. The West Frisians (Texel, &c.), are Dutch, and the East Frisians (Borkum, &c.), are German.

Frisians, a German tribe which, about the beginning of the Christian era, occupied the territory between the mouths of the Rhine and the Ems. In time they extended as far eastward as Slesvig, and even made settlements on the Firth of Forth, and probably in other parts of Northern Britain. About the end of the seventh century the Frisians in the southwest were subdued by the Franks under Pépin d'Héristal. A century later the eastern branch of the tribe was conquered and Christianized by Charlemagne. The Frisian language holds in some respects an intermediate position between Anglo-Saxon and Old Norse. Of all the Teutonic dialects it is the most nearly related to

English. Its ancient form exists only in some remarkable collections of laws.

Frith, William Powell (1819-1909), English painter. His pictures include: *Coming of Age in the Olden Time* (1849), *Life at the Sea-side* (1854), *Ramsgate Sands* (1854—bought by Queen Victoria), *The Derby Day* (1858—now in the National Gallery), *The Railway Station* (1862), *Before Dinner at Boswell's Lodgings* (1868—sold in 1875 for £4567), *The Private View at the Royal Academy* (1881), &c.

Fritillary (Fritillaria), a genus of plants, nat. ord. Liliaceæ, natives of north temperate regions. *F. Melcagris*, or common fritillary, is found in meadows and pastures in the eastern and southern parts of England.

Fritillary, the popular name of butterflies belonging to the large family Nymphalidæ, of which there are over 4000 species. British species are: silver-washed (*Argynnis paphia*), dark-green (*A. aglaia*), queen of Spain (*A. latonia*).

Friuli, formerly an independent duchy at the head of the Adriatic, and from 1866 to 1918 forming part of Italy and Austria. By the Treaty of Rapallo (1920) it became entirely Italian. The area is about 3300 sq. miles, and the pop. 700,000. The inhabitants, called Furlani, are Italian for the most part, but speak a peculiar dialect

Frobisher, Sir Martin (c. 1535-1594), English navigator. He made three expeditions to the Arctic regions for the purpose of discovering a north-west passage to India. In the fight with the Spanish Armada in 1588 he commanded one of the largest ships in the fleet. In 1594 he was sent to the assistance of Henry IV of France, when, in an attack on a fort near Brest, he was mortally wounded.

Froebel, Friedrich Wilhelm August (1782-1852), German educationalist. He developed a system which has become famous under the name of *Kindergarten* (q.v.). He is the author of *Die Menschenenerziehung*, and *Mutter- und Koslieder*, a book of poetry and pictures for children.

Frog, the common English name of a number of animals belonging to the class Amphibia, known as Anura or tailless Amphibia. They constitute the family Ranidæ, which ranges over most of the world. Typical species are the common or grass frog (*Rana temporaria*), edible frog (*R. esculenta*), and the bull frog (*R. catesbiana*) of North America. In the

spring the spawn is deposited in ponds and other stagnant waters in large masses, each blackish egg being surrounded by a gelatinous sphere. The eggs hatch out into fish-like tadpoles, which at first breathe by external and later on by internal gills. The adult form is reached

exact.—Cf. Madame Darmesteter (Duclaux), *Froissart*.

**Frome**, or **Frome-Selwood**, a town, England, Somerset, 19 miles south-east of Bristol. The staple manufactures are woollen cloths. Pop. (1931), 10,738.

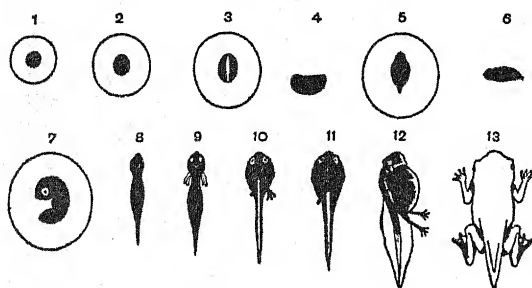
**Fronde**, a French party during the minority of Louis XIV, which waged civil war from 1648 to 1654 against the Court party on account of the heavy fiscal impositions laid on the people by Cardinal Mazarin. At the head of the Fronde stood the Cardinal de Retz (q.v.), and afterwards the Prince Louis Condé. The name is from Fr. *fronde*, 'a sling', a member of the Parliament having likened the party to boys slinging stones in the streets.

**Frontinus**, Sextus Julius (c. A.D. 40–106), Roman writer. He was Governor of Britain from 75 to 78. His *De Strata-gematis*, a treatise on war, and his *De Aqueductibus Urbis Romæ* are still extant.

**Fronto**, Marcus Cornelius (c. A.D. 100–170), Roman grammarian and rhetorician. He was tutor to the imperial princes Marcus Aurelius and Lucius Verus. His extant remains consist chiefly of some letters to his royal pupils, discovered in 1815.

**Frost**, the state of the weather when the temperature is below the freezing-point of water (32° F.). The intensity of the cold in frost is conveniently specified in *degrees of frost*, or the number of degrees by which the temperature of the atmosphere is below the point at which the freezing of water commences. When the dew-point is below 32° F., and the air is cooled to that dew-point, the vapour is deposited directly in the solid form, as *hoar frost*. *Rime* is produced during fogs by accumulation of frozen moisture on trees or other objects.

**Frost-bite** is caused by the freezing of the superficial tissues of the body. During the process of thawing, intense pain is experienced, which passes away, to be followed by itching and tingling. During the winter months of the European War (1914–1918) in France many



Life-history of the Frog

1, Egg freshly deposited. 2, Egg developing. 3, Embryo lengthening, groove visible along back. 4, Same extracted from jelly, and viewed from side. 5, Head, trunk, and tail distinguishable from above. 6, Same extracted from jelly and viewed from side; external gills just visible. 7, Tadpole coiled up in jelly shortly before hatching out. 8, Freshly hatched tadpole, side view. 9, Tadpole with external gills on both sides. 10, External gills covered over by fold on right side, but still visible on left. 11, External gills of both sides covered by fold, but "spout" for escape of water that has passed through the gill slits visible on left side. 12, "Spout" still present; hind legs developed; viewed from side. 13, Front legs also developed; gill cover disappeared, gill-slits closed, tail being absorbed; tadpole nearly ready to leave the water.

by loss of gills and tail, and the development of lungs and limbs.

**Froissart**, Jean (1337–?1410), French poet and historian. At the age of eighteen he went to England, Philippa of Hainault, wife of Edward III, declaring herself his patroness. After returning to the Continent and travelling for some time, he again visited England, and from 1361 to 1366 he was a secretary to the queen. After her death, Froissart became *curé* of Lestines in Hainault. Little is known of the closing part of his life, which is said to have terminated at Chimay. His *Chronicle*, which reaches down to 1400, gives a singularly vivid and interesting picture of his times. The earliest, and in some respects the best, English translation of his *Chronicle* is that of Lord Berners (London, 1525), although that by Thomas Johnes (1803–1805) is more



soldiers were invalidated with so-called frost-bite of the feet. This was known later as trench-foot, and was not true frost-bite, but was due to changes in the blood-supply of the feet, brought on by prolonged exposure to damp conditions.

Froude, James Anthony (1818–1894), English historian and miscellaneous writer. Between the years 1856 and 1869 appeared his great work *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*. He was made literary executor to Carlyle, and his *Life of Carlyle*, *Carlyle's Reminiscences*, and *Letters and Memorials of Jane Welsh Carlyle*, as edited by him, provoked much criticism. Among his other works are: *Short Studies on Great Subjects*; *The English in Ireland in the Eighteenth Century*; *Julius Caesar*; *Oceana*, or *England and her Colonies*; and *The English in the West Indies*.—Cf. Herbert Paul, *Life of Froude*.

Fruit, in botany, the mature ovary of a plant, composed essentially of two parts, the pericarp and the seed. In a more general sense the term is applied to the edible succulent products of certain plants, generally covering and including their seeds. The hardier sorts of fruits, such as are indigenous to Britain, or which have been cultivated to any important extent there, are the apple, pear, plum, cherry, apricot, peach, and nectarine; the gooseberry, currant (red, white, and black), strawberry, strawberry, and mulberry. The more important fruits requiring a warmer climate are the fig, date, grape, orange, lime, banana, tamarind, pomegranate, citron, bread-fruit, olive, almond, melon, and coco-nut.

Fry, Elizabeth (1780–1845), English philanthropist. In 1810 she became a preacher among the Friends. In 1817 she succeeded in establishing a ladies' committee for the reformation of women-prisoners in Newgate, along with a school and manufactory in the prison, the results of which proved eminently satisfactory. In the pursuit of her philanthropic labours she made tours through various parts of the United Kingdom, and also visited France, Belgium, Germany, and Holland. Cf. G. King Lewis, *Elizabeth Fry*.

Fryatt, Charles (1872–1916), British sailor. During the European War, Captain Fryatt's ship, the cross-Channel steamer *Brussels*, was attacked by a German U-boat near the Maas Lightship, and

attempted to ram the submarine. The enemy pretended that he had acted against the usages of war, as he did not belong to the combatant forces. On 23rd June, 1916, Captain Fryatt was captured by a German destroyer, taken to Zeebrugge, and thence to Ruhleben and Bruges, where he was court-martialled and shot.

Fuad, Ahmed Fuad Pasha (1868– ), King of Egypt, the youngest son of Ismail Pasha, and brother of Hussein Kamil, the first Sultan of Egypt. He succeeded his brother as Sultan of Egypt on 9th Oct., 1917, becoming King in 1922.

Fuad Pasha, Mehemed (1814–1869), Turkish statesman and man of letters. He was four times Minister of Foreign Affairs, and for five years Grand Vizier; and was the chief support of the reform party in the Turkish Empire. He wrote poetry, political pamphlets, and a Turkish grammar.

Fucaceæ, a natural order of dark-coloured Algae, consisting of olive-coloured sea-weeds, existing in all parts of the ocean. See *Fucus*; *Brown Algae*.

Fuchsia (named after the discoverer, Leonard Fuchs, a German botanist), a genus of beautiful flowering shrubs, natives of South America, Mexico, and New Zealand, nat. ord. Onagraceæ, characterized by having a funnel-shaped, coloured, deciduous, four-parted calyx, sometimes with a very long tube. The hardy varieties grown out-of-doors are common ornamental shrubs in British gardens.

Fucino, formerly a lake of Southern Italy, about 11 miles long and 5 miles broad, 2181 feet above sea-level, in the province of Aquila in the Central Apennines. The lake has now been drained by a tunnel originally built by the Emperor Claudius, and 36,000 acres of rich arable land reclaimed.

Fucus, a genus of sea-weeds, family Fucaceæ, including various common seaweeds which are used for manure and for making kelp, an important source of iodine.

Fuels are materials which can be burnt economically for the generation of heat to be applied to some useful purpose, such as domestic heating, steam raising, firing of furnaces, &c. They may be solid, liquid, or gaseous, and may be used in the natural state or after being prepared by some suitable process. Solid fuels

contain combustible matter consisting largely of carbon and hydrogen either combined or in the free state, and incombustible matter in the form of ash. Liquid and gaseous fuels consist mainly of combustible matter, and generally contain little ash. The combustible matter in solid fuels is present in two forms, viz. volatile matter, which is driven off when the substance is submitted to heat out of contact with air, the residue left behind being charcoal when wood is heated, and coke when coal is heated, each of these materials consisting of fixed carbon together with the ash present in the original material.

The natural fuels are wood, peat, coal, natural oils, and natural gas. Wood may be considered as the natural fuel of man. It is still used to some extent for domestic purposes, and in certain parts of the world for some industrial purposes also. *Peat* (q.v.) consists of partially-decayed vegetable matter occurring in beds of varying thickness from a few feet upwards. There is a tendency towards the increased use of peat as a fuel, and there is every probability that peat and peat products will become much more important as fuels in the future than they have been in the past. It is estimated that there are over 9000 sq. miles of peat deposits in Great Britain. *Coal* (q.v.) is by far the most important natural fuel. In its strictly correct usage the name comprises only the compacted carbonaceous materials such as lignite, bituminous coals, and anthracite. *Lignite* or *brown coal* is used for domestic, manufacturing, and locomotive purposes in districts remote from ordinary coal-fields. *Bituminous* coals include all the most important classes of carboniferous fuel, and may be divided into the following classes: (1) gas, (2) coking, (3) house, (4) manufacturing or iron smelting, and (5) steam, which grade one into the other. *Anthracite* represents a stage of mineralization beyond coal. It is largely used for malting purposes and for drying hops, where a steady heat is required, and also to some extent in iron smelting and in the manufacture of producer-gas. The importance of coal as a fuel may be realized from the fact that the estimated world's production of coal in 1913 was about 1321 million tons, and in 1922 about 1332 million tons.

*Natural oils* or *petroleums* are found in many parts of the world, and are largely used as fuel for steam raising and general industrial purposes. Before use, they are generally submitted to distillation, and are thus to an extent prepared fuels, and will be considered below. *Natural gas* occurs in certain localities in very large quantities, and in Pennsylvania has been used as a fuel on a large scale. It is composed chiefly of marsh gas, with some hydrogen and nitrogen, and has a high heating value.

*Prepared fuels* may be either solid, liquid, or gaseous in form, the chief prepared solid fuels being charcoal, peat charcoal, peat briquettes, coke, coalite or semi-coke, coal briquettes, and pulverized coal. *Charcoal* is the result of heating wood out of contact with the air. It is still used for certain metallurgical purposes with advantage, owing to its freedom from injurious substances. With regard to *prepared peat* fuel, the chief problem in its economic utilization consists in freeing it from the excessive amount of water it contains. By the thorough maceration of the peat material, followed by briquetting and drying, the best peat briquettes are made. *Coke* (q.v.) is by far the most important prepared fuel at the present time, especially from a metallurgical point of view. There are two classes of coke on the market, gas-coke, which is obtained as a by-product in the coal-gas industry; and metallurgical coke, which is a hard coke produced by the carbonization of selected coals in special ovens at a very high temperature. In addition to these classes of coke there is a product obtained by low-temperature carbonization (q.v.), originally known as *coalite*. Gas-coke is suitable for ordinary fires and for domestic purposes, as it ignites more readily than metallurgical coke, owing to its higher content of volatile matter, and when burnt in suitable grates or stoves, forms an excellent domestic fuel. Metallurgical or blast-furnace coke is large in size and combines great strength with porosity. This class of coke is manufactured either in beehive ovens, in which the valuable by-products such as tar, ammonia, &c., are lost, or in specially designed coke ovens arranged for the recovery of these by-products. The practice of by-product coking had become almost universal in

Germany before the European War, and in the United Kingdom by-product ovens are gradually replacing other forms, in 1919 about 80 per cent of the metallurgical coke made here being produced in by-product ovens. *Coal briquettes* have become of considerable importance. They are usually made of fine coal compressed with some form of cementing material, such as tar or pitch. The burning of finely-pulverized coal for steam raising, furnace purposes, &c., has made great strides during recent years.

The *prepared liquid fuels* consist of distillation products from the treatment of natural oils, the products of distillation of oil shales, and various oil and tarry matters from gasworks, coke-oven plants, gas producers, and blast-furnaces. By the distillation of natural oils, the lighter oils are first obtained for special purposes, and the residue is used for fuel oil. Oil fuels have many advantages over solid fuels, including the following: a reduction in weight of about 40 per cent, and in volume by about 35 per cent; a reduction in the number of stokers required; a very small amount of ash to be handled and disposed of; prompt kindling and early attainment of maximum temperature. Oil is being used to an increasing extent in steamships, power-stations, and for many industrial purposes, including metallurgical furnaces.

With regard to *artificial gaseous fuel*, there are many types used for lighting and heating purposes. These include ordinary coal-gas (see *Gas Manufacture*), coke-oven gas, producer-gas (q.v.), water-gas (q.v.), oil-gas, and waste-furnace gas, especially that from iron blast-furnaces. Generally speaking, coal-gas is too expensive for furnace heating, but there are many minor operations in which its use is convenient. Producer-gas is the most important gaseous fuel used in the industries. For special purposes water-gas is used. Oil-gas is made by the destructive distillation of oil at a high temperature, with or without the use of steam; it is largely used for lighting purposes, and is also used for furnace work on a small scale. The gas evolved from certain metallurgical furnaces, and especially from iron blast-furnaces, is very similar in composition to ordinary producer-gas, and forms a valuable gaseous fuel. It is largely used for firing boilers, heating

the hot-blast stoves in connexion with the furnaces, and direct in gas-engines. The use of gaseous fuel in the various industries has many advantages, including the following: the perfect control under which the supply of gas and air may be maintained; perfect combustion without smoke may be obtained with only a very slight excess of air over that necessary for combustion; much higher temperatures can be obtained than are possible with solid fuel, especially when both the gas and the air are preheated; a commoner fuel may be used; and the gas can be conveyed to different parts of the works through pipes with great ease.—BIBLIOGRAPHY: W. A. Bone, *Coal and its Scientific Uses*; Sexton and Davidson, *Fuel and Refractory Materials*; H. S. Jevons, *The Coal Trade*.

Fuerteventura, one of the Canary Islands, separated from Lanzarote by the Strait of Bocayna. Cabras on the east coast has a good harbour. Area, 700 sq. miles; pop. about 12,960.

Fugitive Offenders Act, 1881, provides for the arrest in any part of His Majesty's Dominions of persons accused of having committed certain offences in any other part, and for their being brought back to the *locus delicti* for trial. The offences covered by the Act are treason, piracy, and every offence punishable in the *locus delicti* by imprisonment with hard labour for at least twelve months or by any greater penalty. A modified form of the regulations may be applied by Order in Council to any group of British possessions (excluding the United Kingdom, Channel Islands, and Isle of Man) lying contiguous or otherwise suitable, *quoad* the members of the group. See *Extradition*.

Fujiyama, a dormant volcano of a symmetrical cone-like shape, in the Island of Honshu, Japan, the sacred mountain of the Japanese. It has been quiescent since 1707, is 12,400 feet in height, and is visible in clear weather for a distance of nearly a hundred miles. It is one of the most beautiful natural features in the world, and is a familiar part of Japanese artistic designs.

Fukien, a province of China, with an area of 46,320 sq. miles and a pop. of 8,500,000.

Fukui, a town of Japan, on the Island of Honshu, 80 miles N.N.E. of Kyoto. There are manufactures of silk and paper,

and the place is an educational centre. Pop. (1925), 59,943.

Fukuoka, a town of Japan, on the Island of Kiushiu, 86 miles N.N.E. of Nagasaki. It is noted for its silk. Pop. (1925), 146,005.

Fulda, a Prussian town, province of Hesse-Nassau, on a river of the same name, 54 miles S.S.E. of Cassel. It has manufactures of cotton, woollen, and linen goods. Pop. 17,500.

Fulham, a metropolitan borough of the county of London. Pop. (1931), 150,940.

Fuller, Andrew (1754–1815), English Baptist minister. In 1782 he accepted the pastoral charge of a Baptist church at Kettering. His works, frequently reprinted, appeared in Bohn's Standard Library.

Fuller, Thomas (1608–1661), English divine and historian. In 1631 he obtained a fellowship at Sidney Sussex College, Cambridge, and was collated to a prebend in the cathedral of Salisbury. He was next chosen rector of Broad Windsor, Dorset, and lecturer at the Savoy, London. In 1643, during the Civil War, he went to Oxford and joined the king. Soon after the Restoration he was made one of the king's chaplains. Several of his writings are English classics, remarkable for quaintness of style, wit, sagacity, and learning. Among the more important are: *History of the Holy War*, *The Holy and Profane State*, *Pisgah Sight of Palestine*, *Church History of Britain*, and the *Worthies of England*.—Cf. J. E. Bailey, *The Life of Thomas Fuller*.

Fuller's Earth, a variety of clay or marl, useful in scouring and cleansing cloth. It consists of some 60 per cent of silica with alumina and water, and the usual impurities of clays. There are extensive beds of this earth in southern English counties.

Fulmar, an Arctic sea-bird (*Fulmarus glacialis*) of the family Procellariidae or petrels, about the size of a large duck. It inhabits the northern seas in prodigious numbers. It makes its nest on sea-cliffs, and lays only one egg. Its feathers, down, and oil are of commercial value. There is a second and larger species (*F. pacificus*) found in the Pacific Ocean, and a third (*F. glacialisoides*) in the Antarctic. The natives of St. Kilda valued the eggs above those of any other bird, and the oil was one of the island's principal products.

Fulton, Robert (1765–1815), American

engineer. In 1794 he took a patent for a double inclined plane, which was intended to supersede locks on canals; and he also patented a mill for sawing marble, machines for spinning flax and making ropes, and a dredging-machine. In 1797 he went to Paris, where his chief occupation was the invention of torpedoes for naval warfare. He returned to America in 1806, and built a steamboat of considerable dimensions, which began to navigate the Hudson River in 1807. Its progress through the water was at the rate of 5 miles an hour.

Fumariaceæ, a small natural order of Dicotyledons, closely allied to Papaveraceæ, found in the temperate and warm regions of the northern hemisphere and South Africa.

Fumigation is the application of vapours for the purpose of disinfecting rooms, clothing, bedding, and the like. The most commonly used substances are: sulphur, either burned openly or in the form of sulphurous acid gas in cylinders; chlorine, generated from chlorinated lime; and formaldehyde.

Fumitory, the common name of *Fumaria*, a genus of plants, nat. ord. Fumariaceæ. Several species are known, natives of Europe and Asia, and two or three are found in Great Britain.

Fu-nan, the Chinese name for Cambodia (q.v.).

Funchal, the capital of the Island of Madeira, situated on a bay on the south coast. There is good anchorage in from 5 to 15 fathoms. It is a coaling-station for steamers, and is much resorted to by invalids afflicted with pulmonary complaints. Pop. 24,687.

Funds, Public, and Funded Debt, money lent to the Government and constituting a national debt. These debts are distinguished as unfunded or floating when they are contracted to be paid off at a specified date; funded, when the interest only is paid, and the debt itself need never be paid at all. Funding a debt then means simply rendering it irredeemable, or redeemable only at the option of the borrower. See *National Debt*.

Fundy, Bay of, a large inlet of the Atlantic, on the east coast of North America, separating Nova Scotia from New Brunswick. It is noted for its impetuous tides, which cause a rise and fall of from 12 to 70 feet, and the navigation is



dangerous. At its entrance are Grand Manan and other islands.

Fünen, the second largest of the Danish islands, separated from Zealand by the Great Belt, and from Jutland by the Little Belt; circuit, about 185 miles; area,

Fungi, a very large division of cryptogamous or flowerless plants, comprising not only the different kinds of mushrooms and toadstools, but also a large number of minute parasites, such as mildews, rusts, and smuts, and also the various



Fungi

- 1, Milky fungus. 2, Fly Agaric. 3, Common mushroom. 4, Ink-cap. 5, Stinkhorn, 6, Puff-ball. 7, Parasol mushroom. 8, Jew's ear.

1132 sq. miles. The interior, towards the west, is covered by a range of low hills, but with this exception it is composed of large and fertile plains, under good cultivation. The chief towns are Odense, Svendborg, and Nyborg. The pop. is 252,258.

Fünfkirchen. See *Pecs*.

moulds, yeasts, dry-rot, &c. They agree with the Algae in being thallophytes, but differ in their mode of nutrition; they possess no chromatophores, and thus live either as saprophytes on dead organic matter, or as parasites at the expense of a living host. Most of the diseases of plants are due to the attacks of parasitic Fungi;

but the useful work done by the saprophytic forms, as scavengers which prevent the accumulation of animal and vegetable debris, more than compensates for the destruction wrought by the parasitic species. Though many Fungi are edible, others are highly poisonous. The plant-body of Fungi nearly always consists of a richly branched system of delicate filaments called a *mycelium*. The reproductive organs of Fungi generally take the form of minute *spores*, which are always floating in the atmosphere, and form the source of moulds.

The principal sub-divisions are as follows: (1) *Phycomycetes*, or Lower Fungi.—Sexual organs prevalent. Largely aquatic Fungi. Examples: *Phytophthora infestans* (potato-blight); *Mucor Mucedo* (common or black mould). (2) *Eumycetes*, or Higher Fungi.—Sexuality usually reduced or absent. Almost all terrestrial Fungi. There is one stereotyped form of principal reproductive organ, viz. either the *ascus*, a tubular sac containing eight *ascospores*, or the *basidium*, a club-shaped organ budding off four *basidiospores* from its upper end. (a) *Ascomycetes*.—Principal reproductive organ the *ascus*. Examples: *Eurotium Aspergillus glaucus* and *Penicillium crustaceum* (common green and blue moulds). (b) *Basidiomycetes*.—Principal reproductive organ the *basidium*. Examples: *Ustilago Avenae* (oat-smut); *Puccinia graminis* (wheat-rust); *Merulius lacrymans* (dry-rot); *Agaricus campestris* (mushroom). (3) *Fungi Imperfecti*.—Fungi of which the complete life-cycle is not yet known.

**Fungicide**, any substance used to combat the attacks of parasitic Fungi on cultivated plants. One of the best is Bordeaux mixture (slaked lime and copper sulphate).

**Fur and Fur Trade**. Fur is the fine soft hairy covering of certain animals, especially the winter covering of animals belonging to northern latitudes. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, musk-rat, squirrel, hare, rabbit, the chinchilla, bear (black, grey, and brown), otter, sea-otter, seal, wolf, wolverine or gnutton, marten, ermine, lynx, coypou (nutria), polecat (fitch), opossum, and fox. Drying is the only preparation required by skins before being sent to the market. The small skins are sometimes previously steeped in a solution of alum. The fur-

dresser, on receiving a skin, first subjects it to a softening process. He next cleans its under surface from loose pieces of the integument by scraping it with an iron blade. Finally, the fur is cleaned and combed, after which the skin is ready to be cut into any required shape. The following table gives the chief fur-producing countries:

Country.	Kind of Fur.
Canada and Siberia	Sable, mink, ermine, red and silver fox, lynx, beaver, musquash, otter.
Within the Arctic Circle	White fox, seal, and polar bear.
United States	Skunk, raccoon.
Australia	Opossum, wallaby, and coney.
Peru and Argentine	Chinchilla.

Other countries which yield fur are Armenia, Turkey, Austria, Scandinavia, and certain parts of China. The French were the first to take up the fur trade in Canada, and they soon had a chain of trading stations stretching from Hudson Bay to New Orleans. In 1670 the *Company of Adventurers of England trading into Hudson Bay* was formed. This became the greatest fur-trading concern in the world, obtaining possession of enormous tracts of land, much of which it was obliged to cede to the Canadian Government in 1869. It is still, however, a very wealthy company, with numerous forts, stations, agents, and trappers all over Canada. London and Leipzig are the greatest fur markets in the world, though St. Louis, U.S.A., is almost as important.

**Furies** (Gr. *Eumenides* or *Erinnyes*, Lat. *Furiæ* or *Diræ*), goddesses who were originally personifications of the curses pronounced upon guilty criminals. The crimes which they punished were failing to honour father and mother, perjury, murder, and violation of the laws of hospitality or of the rights of suppliants. They were supposed to be able to destroy all peace of mind, and to make their victim either childless or unfortunate in his children. Some late writers limit their number to three, and give them the names of Tisiphone, Alecto, and Megæra.

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view: (1) to obtain the greatest quantity of heat from a given quantity of fuel; (2) to prevent the dissipation of heat after it is produced; (3) to concentrate the heat and direct it as much as possible to the substance to be acted upon; (4) to be able to regulate at pleasure the necessary degree of heat, and have it wholly under the operator's control. Furnaces may be arranged for the combustion of solid fuels, such as wood, charcoal, coal, coke, or anthracite; for liquid fuels, such as crude natural oils, distilled oils, tar, &c.; or for gaseous fuel, such as coal-gas, producer-gas, waste furnace-gas, &c. In special cases they are arranged for the utilization of electrical energy (see *Electro-metallurgy*). The method of applying the heat generated to the work in hand varies considerably, and may consist of direct heating, as in blast-furnaces. Direct heating may consist of the flame or products of combustion only coming in contact with the material, as in reverberatory furnaces. Indirect heating is utilized in those cases in which crucibles are used. Furnaces are generally classified according to their form or design.

Shaft-furnaces consist of vertical walls, either circular or rectangular in cross-section. The fuel used in shaft-furnaces is usually solid, and is mixed with the charge to be treated or added in separate layers during the charging. Oil or gas is sometimes used as fuel in these furnaces, and recently powdered coal has also been used. Shaft-furnaces may be conveniently subdivided into three classes, viz. kilns, cupolas, and blast-furnaces. Kilns are relatively short and wide, and are chiefly used for calcining ore, limestone, &c. Cupolas are relatively low-temperature furnaces, circular in shape, with a small diameter. Blast-furnaces (q.v.) are shaft-furnaces in which ores and metallurgical products are smelted with high-pressure blast.

Reverberatory furnaces (q.v.) are those in which the material to be heated or smelted is charged into one part of the furnace separated from the part in which the fuel is burnt. When the air required in a reverberatory furnace is passed through pipes around which the hot waste gas from the furnace is passed, it is known as a recuperative furnace. When pre-heated air, or air and gas, is used in the furnace, it is known as a regenerative furnace.

Crucible furnaces are those in which the material to be treated is contained in crucibles. These furnaces are also known as wind- or pot-furnaces.

Muffle-furnaces are arranged for the heating of charges out of contact with the fuel or products of combustion.

Retort-furnaces are similar to muffle-furnaces, and are used in the metallurgy of zinc, and for the extraction of arsenic.

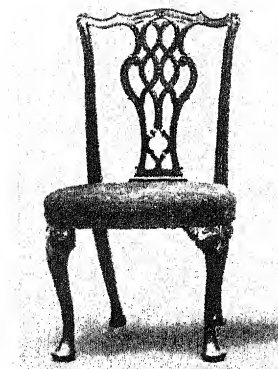
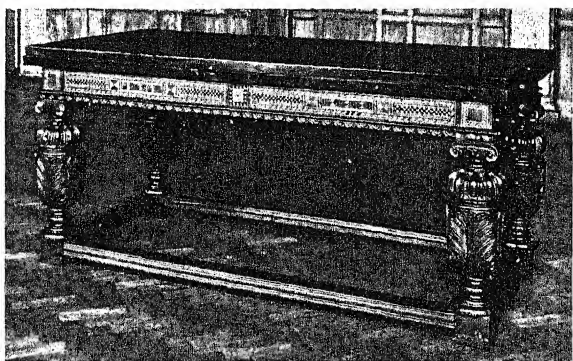
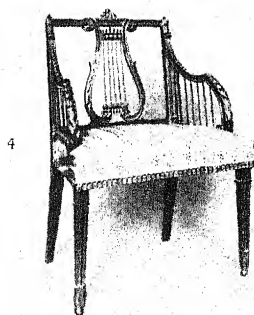
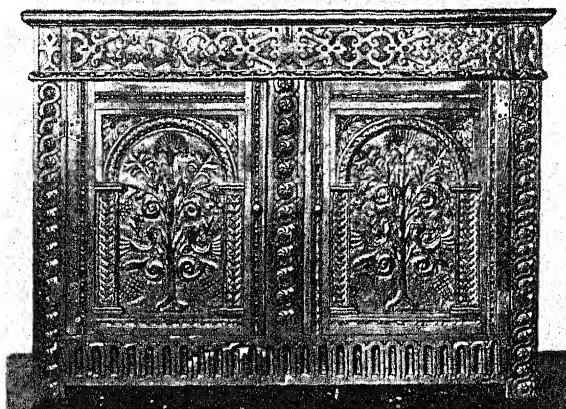
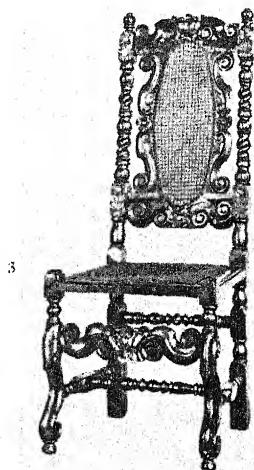
**Furneaux Islands**, also called **Flinders**, a group belonging to Tasmania, at the east end of Bass Strait, Flinders Island being the largest. The inhabitants, who number about 600, procure a living by seal-fishing and preserving mutton-birds, a species of petrel.

**Furness**, a district of N.W. Lancashire, forming part of what is called the Lake District.

**Furniss**, Harry (1854–1925), British caricaturist, author, and lecturer. In 1884 he joined the staff of *Punch*, and became one of its most popular illustrators. His works include: *Confessions of a Caricaturist* (1901), *Harry Furniss at Home* (1903), *How to draw in Pen and Ink* (1903), besides novels and plays for the cinematograph.

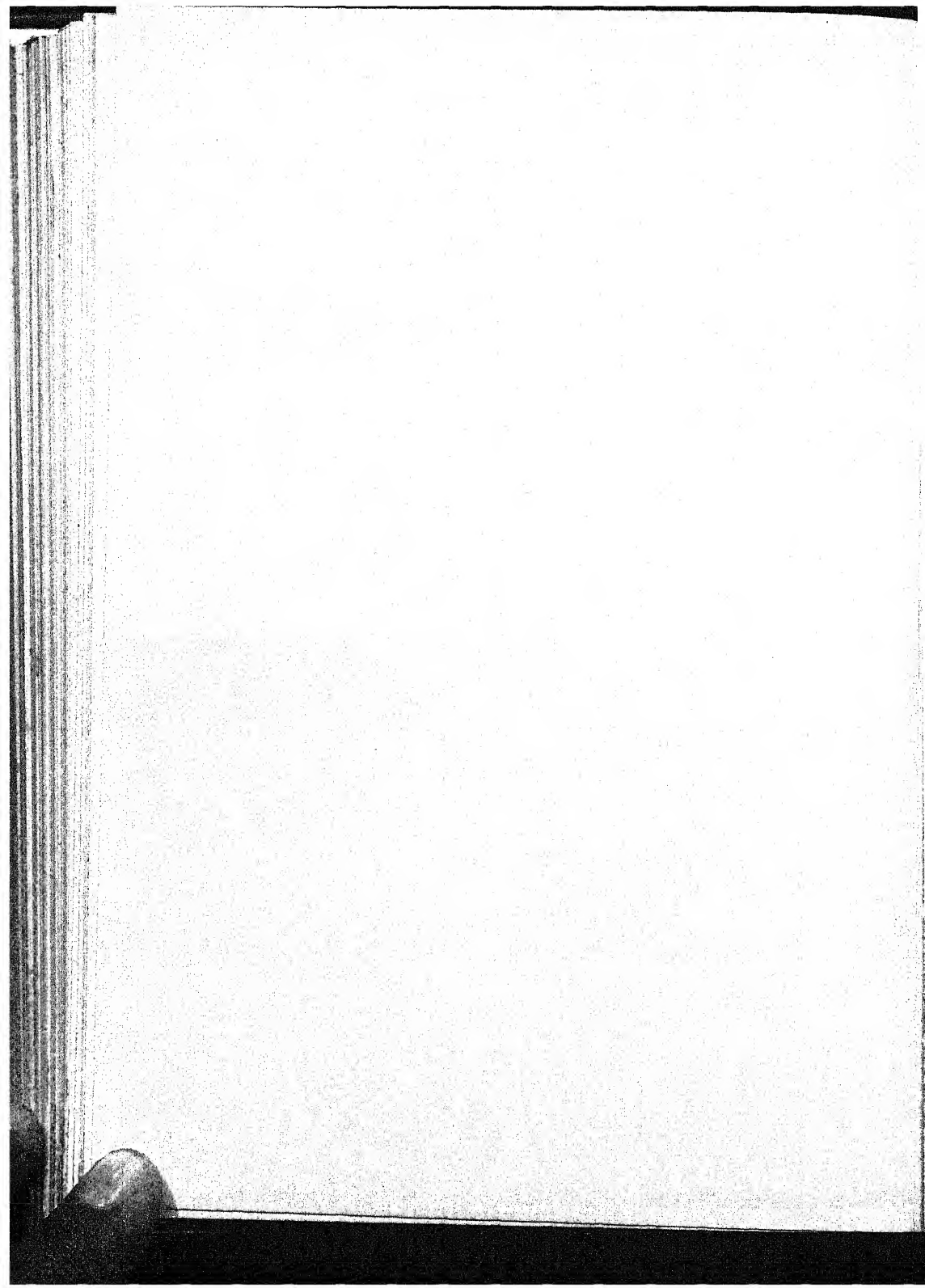
**Furniture**. In a review of ancient furniture, Egypt, as the oldest known civilization, takes a foremost place. Ancient Egyptian furniture was painted, inlaid with fine woods or ivory or glass, and sometimes plated with gold. Sphinxes as supports and terminal ornaments, and animal feet to chairs and couches, are prototypes which descended to later schools. The principal collections of Egyptian furniture are in the British Museum, the Louvre, Paris, the Leyden Museum, the Berlin Museum, and the museum at Cairo. Of Babylonian furniture, and of the subsequent Assyrian epoch, few remains exist. The forms are mostly recorded in the sculpture of the period. At the British Museum there is a plaster cast of Gudea, a king of Babylon about 2500 B.C., and an Assyrian bronze throne shows feet of animal form as in earlier Egyptian design. An Assyrian throne (*circa* 880 B.C.) has rams' heads as terminals. The Bible has many references to Jewish furniture, but Judæan work was largely derivative from Egypt and Assyria, and nothing is preserved. Greek furniture is mainly known from sculpture. Drawing upon other earlier sources, the

# FURNITURE



1. Oak Cupboard, early 17th century. 2. Oak Table, about 16th century. 3. Walnut Chair, period of Charles II. 4. Chair, style of Sheraton. 5. Chair, style of Chippendale. 6. Chair, style of Chippendale. 7. Chair, style of Hepplewhite. 4, 5, 6, and 7 are Mahogany.

By permission of the Director and Secretary of the Victoria and Albert Museum, London



Greeks evolved a distinct type of furniture, from which succeeding ages have adapted many designs. The excavations at Herculaneum and Pompeii in the eighteenth century enabled the Roman house with its domestic furniture to be reconstructed. In Roman furniture there was an amplification of ornament supplanting the beauty and simplicity of the Greek design. The materials employed were gold, silver, bronze, ivory, marble, and wood, and these were decorated by carving, damascening, veneering with coloured woods, or inlaying with precious stones. After the seat of empire was removed from Rome, the Byzantine style arose in Constantinople, from A.D. 321 till about 1204. It was during the thirteenth and fourteenth centuries that mediæval art in Europe reached its zenith. At the Cluny Museum, Paris, a rich collection of Gothic coffers of the fifteenth and sixteenth century is exhibited. At the Landesmuseum, Zurich, a representative series of old Swiss chests shows fifteenth- and sixteenth-century types based on German work. In England the great effects of the Renaissance in art were derived from the Continent. Flemish woodworkers settled in England, and the harmonious blending of the designs of the Italian and Flemish schools resulted in the growth in England of the style known as Tudor. Oak was the main wood used in all Tudor and early Stewart furniture. In the reign of Edward VI inlay was first used in England to decorate furniture, and chests with drawers came into use, but not general use. Elizabethan furniture is rich in elaborate and massive carving. The Stewart or Jacobean styles are varied. The term Jacobean includes the reigns of James I, Charles I, the Commonwealth period, and the reign of Charles II, James II, and William and Mary (ending in 1702). Practically a century covers various types, commencing with the continuance of oak, and embracing the adoption of walnut and the beginning of elaborate and nearly modern styles. In the reign of Charles I chests with drawers became popular, and applied baluster ornament was frequently used in them. Spiral twists for chairs were first used about 1635, and at the same time flap tables with folding legs, which later developed into elaborate gate-leg tables, were designed. The first introduction of caned backs and seats took place in the

reign of King Charles II, when the heavy wood framing and carving of the earlier styles was still very pronounced. Under James II the wood ornament gave place to lighter caning more freely used, and to padded or upholstered seats. Chairs with upholstered wings and arms came into use about 1685. Under William and Mary walnut became common, and in consequence greater freedom was possible in fashioning the softer wood. The reign of Queen Anne is indubitably the age when walnut was supreme. Her reign actually was from 1702 to 1714, but the term 'Queen Anne' is applied to furniture made before and after this period. This period is one of solid and sober workmanship. The duty was removed from mahogany in 1733, and from that date the great Mahogany period began. French influence was strong, both upon the metal-worker and the cabinet-maker. The great epoch of Louis XIV had a decided influence in England. In 1753 Chippendale was busy in his workshops at St. Martin's Lane focusing many styles and forming his own eclectic one. In 1754 he published the first edition of his *Gentleman and Cabinet Maker's Director*. But contemporaneous with this movement, and almost antagonistic to it, came the Classic revival. Robert Adam, the Scotsman, one of three brothers, had returned from Italy to revolutionize the arts of furnishing and of architecture. He was appointed architect to the king, and the great Classic revival began. About 1768 certain chairs with straight top-rails were designed by Adam and executed by Chippendale. The two schools here merged. For half a century the styles of Chippendale held sway, from 1730 to 1780. The Hepplewhite school may be said to reckon from about 1775 to 1795, and the Sheraton designs covered a period from about 1790 to 1805, and behind all there was the paramount classic influence of the brothers Adam. It is impossible to put aside the contemporaneous influences the great French cabinet-makers had upon design, under the four great periods Louis XIV, Louis XV, and Louis XVI, followed by the great Classic revival known as the First Empire period. André Charles Boule (1642-1732), succeeded by his four sons, founded an *atelier*, and under Louis XIV introduced his splendour of veneered work in ebony inlaid with tortoiseshell and brass, set in



massive metal mounts. The *Louis Quatorze* period extends from the days of Charles I to the reign of Anne. The chaster cabinet-work of Riesener is found in the Louis XVI period, when the style became more restrained. The influence of the First Empire style on English furniture lasted up to the first quarter of the nineteenth century. A later style, which has been termed the Regency, may really be merged with the George IV period (1820–1830) and the William IV period to 1837. During these years a decadence set in. During the Early- and Mid-Victorian period (from 1837 up to 1887) furniture showed no signs of continuing its great traditions. The period was poor in inventive design, and it was not until the 'eighties that artistic impulses were stirred, under the guidance of William Morris and others, to revert to simpler and more beautiful forms. Trade designers have been, and still are, busy duplicating 'periods'. Conglomerate pieces with Jacobean lines in one portion, eighteenth-century features in another, are much in evidence. But on the whole the twentieth century has shown a steady regard for fine design. Factory production on a large scale has eliminated much of the originality associated with periods of greater leisure, but that applies to other arts as well as to that of cabinet-making.

—BIBLIOGRAPHY: J. H. Pollen, *Ancient and Modern Furniture and Woodwork*; P. Macquoid, *History of English Furniture*; F. Litchfield, *Illustrated History of Furniture*.

**Furnivall**, Frederick James (1825–1910), English philologist. He devoted his life chiefly to the study of early and middle English literature; and was mainly instrumental in establishing the Early English Text Society (1864), the Chaucer Society (1868), the New Shakespeare Society (1874), the Browning Society (1881), the Shelley Society (1881), and the Wyclif Society (1882).

**Furse**, Dame Katherine (1875– ), British organizer. She is a daughter of John Addington Symonds (q.v.). Through her efforts the Voluntary Aid Detachments, established in 1909, developed their activities at the outbreak of the European War. In 1915 she became Commandant-in-Chief of the V.A.D.'s. She was Director of the Women's Royal Naval Air Service from 1917 to 1919; and in 1922 was

appointed Assistant Chief Commissioner of Girl Guides.

**Fürstenwalde**, a town in Prussia, 30 miles E.S.E. of Berlin, on the right bank of the Spree. It has manufactures of woollen and linen cloth, electric lamps, machinery, and glass. Pop. 22,626.

**Fürth**, a town in Bavaria, 6 miles W.N.W. of Nürnberg. It has important and varied manufactures, including mirrors, picture-frames, jewellery, gold-leaf, lead pencils, spectacles, and machinery. The first steam railway opened in Germany, in 1835, was between Fürth and Nürnberg. Pop. (1925), 74,195.

**Furze**, whin, gorse, the common name of the species of the genus *Ulex*, nat. ord. Leguminosae. Two species are natives of Britain. The common furze (*U. europaeus*) is a low shrubby plant with a stem about 2 or 3 feet high and yellow flowers. It is found over large tracts of country—very often in barren sandy soil. The dwarf-furze (*U. nanus*) is found in many parts of the British Isles.

**Fusan**, a seaport in Korea, at the south-east extremity of the peninsula. It is the terminus of the railway from Seoul and is a treaty port. The trade is in cotton, silk, Japanese goods, rice, petroleum, &c. Cod and herring fisheries are extensive. The harbour is good and has been greatly improved by the Japanese. Pop. about 78,161 (including about 38,000 Japanese).

**Fuse**, a tube filled with combustible matter, used in blasting, or to explode shells, mortars, or bombs. Fuses used in mining and quarrying consist of a tube filled with a slow-burning composition, which gradually burns down to the charge. Other types of fuse include the *concussion* and *percussion fuses* for hollow projectiles; the *electric fuse*, which is ignited by the passage of an electric spark through it; and *time* or *mechanical fuses*, used in some forms of torpedo, and with such explosives as dynamite and gun-cotton.

**Fuse, Electric**, a device for preventing damage in an electric circuit when the current happens to exceed a safe value. The fuse consists of a wire or strip of metal forming part of the circuit, and so designed in material and dimensions that it carries the ordinary current without being damaged, but melts, fuses, or 'blows' whenever the current becomes too large. Fuses are generally made of copper, zinc, tin, or lead, or of alloys of these metals,

and are usually mounted in a non-inflammable open case of porcelain or metal.

**Fuseli**, John Henry (1741-1825), English painter, of German-Swiss origin. He was appointed keeper of the Royal Academy in 1804. Among his notable pictures are his contributions to Boydell's *Shakespeare Gallery*, and forty-seven pictures from Milton.

**Fusel-oil**, a liquid of disagreeable odour obtained during the rectification of alcohol from fermentation of sugars and starches. It is used in the preparation of artificial fruit essences, e.g. amyl acetate, for solvent purposes, and in the making of varnishes. Fusel-oil distills mainly at temperatures between 105° and 136° C., and consists of higher homologues of ordinary alcohol, mainly fermentation amyl alcohols,  $C_5H_{11}OH$ .

**Fushiki**, a seaport, island of Honshu, Japan. It is a free port. Pop. 19,000.

**Fusible Metal**, an alloy, usually of lead, tin, and bismuth, but sometimes containing cadmium also, in such definite proportions as to melt at a given low temperature. In steam-engines, a plug of fusible metal is screwed into the crown of the fire-box, so as to melt, when the water gets below the crown, and allow the steam to blow out the fire. It is also used for safety-plugs in water-pipes placed in the ceilings of public buildings or large stores, so that in the event of fire, when the temperature rises, the safety-plugs melt and water is instantly sprayed into the room. See *Fire-extinguishers*.

**Fusible Porcelain**, a silicate of alumina and soda obtained from cryolite and sand, fused and worked as glass, and used for lamp-shades, &c. It is also known as cryolite glass.

**Fusion**, the conversion of a solid body into the liquid state by direct heat, as distinguished from solution, in which the effect is produced by means of a liquid. The term is specially applied to the action of heat on the metals, but it is extended to any solid matter; thus the passage of ice into water at 32° F. is true fusion.

**Fust**, Johann (d. 1466), a goldsmith of Mainz, associated with Gutenberg and Schöffer in connexion with the origin of printing. See *Printing*.

**Fustel de Coulanges**, Numa Denis (1830-1889), French historian. His works include: *Histoire des institutions politiques de l'ancienne France* (1875-1892), *La Gaule*

*Romaine* (1888-1891), *Questions Historiques* (1893), &c. His most famous work, however, is his *La Cité antique* (1864).

**Fustic**, the wood of the *Chlorophora tinctoria*, a tree of the mulberry order growing in the West Indies, with hard, strong, brittle wood. It is much used for dyeing yellow. Young fustic, the wood of the *Rhus cotinus*, a South European shrub, is used for dyeing orange.

**Futhark**. See *Runes*.

**Futuna**, an island belonging to the New Hebrides group, lying 45 miles east of Tanna. It is very healthy, and has an area of 4 sq. miles and a population of 300.

**Futuna Islands**, or **Hoorn Islands**, two small islands, Futuna and Alopi, lying 300 miles north-east of Fiji. Together with the Wallis Is. they became a French colony in 1917. They contain coco-nut groves and valuable forests. Pop. 1500.

**Futurism**, a term often loosely applied to the modern movement in art as a whole, but properly describing the doctrines of a group of Italian (mainly Milanese) painters, sculptors, and poets, first published in 1909 in a manifesto signed by F. T. Marinetti, the poet and chief inspirer of the group, and amplified in subsequent manifestos. These doctrines apply to art a general philosophy of life, which has its origin in modern theories relating to matter and energy, and has for its chief points the rejection of all tradition (whence the name Futurism), and the worship of speed and conflict as the typical characteristics of modern civilization. In art, the Futurists aim at representing not what the eye sees, but the sensation of movement and growth itself. One method of doing this is the representation of simultaneous states of mind; so that in painting an object, the artist brings together on one canvas not only what he sees, but what he knows or remembers about it. The most orthodox of the group is Luigi Russolo; Carlo D. Carra and Giacomo Balla mainly produce descriptive catalogues on canvas, in attractive colour. The work of Umberto Boccioni, both painter and sculptor, is similar, but more attractive in design. Gino Severini, the best known of the Futurists, was formerly notable for his gay and fanciful colour patterns. Of late, he has turned to Cubism, and has even produced some purely academic work. See *Vorticism*.

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## G

**G**, the seventh letter in the English alphabet. English *g* hard is a guttural mute, the 'voiced' or soft or sonant sound corresponding to the 'breathed' or hard or surd sound *k* (or *c* hard). This sound of *g* is what the letter always has before *a* (except in *gaol*), *o*, *u*, and when initial also before *e* and *i* in all words of English origin, and when final. The soft sound of *g*, or that which it more commonly has before *e*, *i*, and *y*, as in *gem*, *gin*, *gymnastics*, is a palatal sound the same as that of *j*, and did not occur in the oldest English or Anglo-Saxon.

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**Gainsborough**, a market town, England, county of Lincoln, on the Trent, which is navigable by vessels of from 150 to 200 tons, and is connected with the main canal system. There are oil-mills, breweries, rope-walks, foundries, and malt-houses. Water is obtained from artesian wells. Pop. (1931), 18,684.

**Gairdner**, James (1823–1912), English historian. In 1846 he entered the Public Record Office, and in 1859 became an Assistant Keeper. He edited, for the Master of the Rolls, *Memorials of Henry VII*, and *Letters and Papers of the Reigns of Richard III and Henry VII*, and on Professor Brewer's death was appointed to succeed him as editor of the *Calendar of State Papers of Henry VIII*. He also edited the *Paston Letters*, and was the author of *The Life and Reign of Richard III*, *Henry VII*, and *Lollardy and the Reformation in England*.

**Gairdner**, a salt lake of South Australia, the lower end being about 70 miles due west from the head of Spencer's Gulf. It is 100 miles long, and the greatest breadth is 40 miles.

**Gaius**, a Roman lawyer of the time of Hadrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his *Institutes* are particularly important, as the only tolerably full, systematic, and well-arranged source of the old Roman law. The bulk of the work in MS. was discovered in 1816 by Niebuhr.

**Galago**, the native name of a genus of lemurs found in Africa. The great galago (*G. crassicaudatus*) is as large as a rabbit. They live in trees.

**Galahad**, Sir, the son of Lancelot and Elaine in the Arthurian romances. He was the noblest of the Knights of the Round Table, a model of purity and chivalry.

**Galanga**, or **Galangal Root**, the dried rhizome of *Alpinia officinarum*, used in medicine in cases of flatulence and dyspepsia. The greater galangal is the rhizome of *A. Galanga*.

**Galapagos**, a group of thirteen islands of volcanic origin in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong; area, 2868 sq. miles. The most important are Albemarle, 60 miles long by 15 miles broad, Indefatigable, Chatham, Charles, James, and Narborough. Of these some are used by the Republic of Ecuador as penal settlements. The elephant tortoise is peculiar to the Galapagos group.

**Galashiels**, a burgh in Scotland, in the county of Selkirk, on both sides of the Gala, about a mile above its confluence with the Tweed. It is noted for its manufactures of tweeds, plaids, shawls, and woollen yarns. Pop. (1931), 13,102.

**Galatea**, in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. *Galatea* is also the name of a statue said to have been endowed with life by Venus at the prayer of the sculptor Pygmalion.

**Galatia**, the ancient name of an extensive region in Asia Minor, so called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the third century B.C.

**Galatians**, *Epistle to the*, one of the most important epistles of St. Paul, written probably about A.D. 56, soon after his second visit to Galatia, recorded in



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Gaillard Cut, the correct name for what is popularly known as the Culebra Cut. See *Panama Canal*.

Gainsborough, Thomas (1727-1788), English painter. In 1774 he moved from Bath to London, and shared with Reynolds and Romney the patronage of the fashionable world. His portraits and landscape (in which latter his naturalism makes him a pioneer) are marked by a subtle handling of tone, and a delicate feeling for colour, which put him in the front rank of English artists.—Cf. Sir W. Armstrong, *Gainsborough and his place in English Art*.

Gainsborough, a market town, England, county of Lincoln, on the Trent, which is navigable by vessels of from 150 to 200 tons, and is connected with the main canal system. There are oil-mills, breweries, rope-walks, foundries, and malt-houses. Water is obtained from artesian wells. Pop. (1931), 18,684.

Gairdner, James (1828-1912), English historian. In 1846 he entered the Public Record Office, and in 1859 became an Assistant Keeper. He edited, for the Master of the Rolls, *Memorials of Henry VII*, and *Letters and Papers of the Reigns of Richard III and Henry VII*, and on Professor Brewer's death was appointed to succeed him as editor of the *Calendar of State Papers of Henry VIII*. He also edited the *Paston Letters*, and was the author of *The Life and Reign of Richard III*, *Henry VII*, and *Lollardy and the Reformation in England*.

Gairdner, a salt lake of South Australia, the lower end being about 70 miles due west from the head of Spencer's Gulf. It is 100 miles long, and the greatest breadth is 40 miles.

Gaius, a Roman lawyer of the time of Hadrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his *Institutes* are particularly important, as the only tolerably full, systematic, and well-arranged source of the old Roman law. The bulk of the work in MS. was discovered in 1816 by Niebuhr.

Galago, the native name of a genus of lemurs found in Africa. The great galago (*G. crassicaudatus*) is as large as a rabbit. They live in trees.

Galahad, Sir, the son of Lancelot and Elaine in the Arthurian romances. He was the noblest of the Knights of the Round Table, a model of purity and chivalry.

Galanga, or Galangal Root, the dried rhizome of *Alpinia officinarum*, used in medicine in cases of flatulence and dyspepsia. The greater galangal is the rhizome of *A. Galanga*.

Galapagos, a group of thirteen islands of volcanic origin in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong; area, 2868 sq. miles. The most important are Albemarle, 60 miles long by 15 miles broad, Indefatigable, Chatham, Charles, James, and Narborough. Of these some are used by the Republic of Ecuador as penal settlements. The elephant tortoise is peculiar to the Galapagos group.

Galashiels, a burgh in Scotland, in the county of Selkirk, on both sides of the Gala, about a mile above its confluence with the Tweed. It is noted for its manufactures of tweeds, plaids, shawls, and woollen yarns. Pop. (1931), 13,102.

Galatea, in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. *Galatea* is also the name of a statue said to have been endowed with life by Venus at the prayer of the sculptor Pygmalion.

Galatia, the ancient name of an extensive region in Asia Minor, so called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the third century B.C.

Galatians, Epistle to the, one of the most important epistles of St. Paul, written probably about A.D. 56, soon after his second visit to Galatia, recorded in

*Acts*, xviii, 23. It was directed against the spread of Judaistic practices in the Galatian churches, and especially against the practice of circumcision.

**Galatina**, a town of Italy, province of Lecce. There is a trade in oil and wine. Pop. 15,000.

**Galatz**, a port in Romania, in Moldavia, on the left bank of the Danube, between the Sereth and Prut at their confluence. The harbour admits vessels drawing 20 feet, is well frequented, and an emporium of trade between Austria, Russia, and Constantinople. The chief exports are grain (principally maize), wine, planks and deals, and tallow. Pop. 73,512.

**Galaxy** (*Via Lactea*, or Milky Way), in astronomy, that long luminous track which is seen at night stretching across the heavens from horizon to horizon. This luminous appearance is occasioned by a multitude of stars so distant and blended as to be separately distinguishable only in telescopes. The galaxy is a sort of sub-universe, of which the solar system forms a part. Some astronomers believe that the spiral nebulae are external galaxies, and that our galaxy seen from one of them would present merely the appearance of a spiral nebula.

**Galba**, Servius Sulpicius (3 B.C.—A.D. 69), Roman emperor. Caligula appointed him general in Germany, and Claudius sent him in A.D. 45 as proconsul to Africa. Nero appointed him Governor of Hispania Tarraconensis, but soon after ordered him to be secretly assassinated. Galba revolted; the death of Nero followed (A.D. 68), and he himself was chosen emperor by the praetorian cohorts in Rome. He was killed after a reign of seven months.

**Galbanum**, or **Galban**, a fetid gum-resin procured from at least two species of umbelliferous plants, which are probably *Ferula galbanifolia* and *F. rubraulis*. It is brought from the Levant, Persia, and India, and is used in medicine, in the arts, and in the manufacture of varnish.

**Galchas**, a number of tribes dwelling on the plateaus and in the valleys of Kohistan, in Ferghana, and on the basins of the Oxus and Zarafshan. They are of Aryan stock linguistically, and physically seem to belong to the Celtic-European race. They are mostly Sunni-Mahomedans by religion.—Cf. W. Z. Ripley, *Races of Europe*.

**Gale**, a plant of the genus *Myrica*, nat. ord. Myricaceae. Sweet gale or bog-myrtle (*M. Gale*) is common in Scotland.

**Galen**, properly *Claudius Galenus* (A.D. 130–201), Greek physician. The writings attributed to him include eighty-three treatises acknowledged to be genuine, forty-five manifestly spurious; nineteen of doubtful genuineness, and fifteen commentaries on different works of Hippocrates, besides a large number of short pieces and fragments, probably in great part spurious. The most valuable of his works were those dealing with anatomy and physiology.

**Galena**, a town of the U.S.A., in Illinois, in the great lead region, situated on both sides of the Fevre River. Pop. 4835.

**Galena** (PbS), mineral sulphide of lead, found both in masses and crystallized in cubes, of a bluish-grey colour. It is soft but brittle, and effervesces with nitric and hydrochloric acids. It is the most important ore of lead, and one of the most important sources of silver.

**Galeopsis**, the generic name of the hemp-nettles, a genus of plants, of the nat. ord. Labiate, characterized by the equally five-toothed calyx. There are about twelve species, three of which are natives of Britain.

**Galesburg**, a city of the U.S.A., Illinois. It has railroad workshops, iron-foundries, and manufactures of agricultural implements. Pop. 23,834.

**Galeus**, the genus including topes, small sharks of the family Carchariidae. The common tope (*Galeus canis*) is abundant in British seas. It is 4 to 6 feet long, and feeds on small fishes and various invertebrates on the sea-bottom.

**Galicía**, a former province of the Austrian Empire, since 1919 absorbed in Poland and Ukraine (q.v.). The Carpathians form a long and irregular curve on the south, and send out branches into Galicía. Farther to the north the hills subside rapidly, and finally merge into vast plains. It has several considerable rivers, those in the west being affluents of the Vistula, those in the east, of the Danube and Dniester. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, and tobacco. The minerals include marble, copper, calamine, coal, iron, petroleum, and rock-salt. Only the last two are of much importance. The principal towns are Lemberg, the capital,

and Cracow. After being the field of continuous strife between Russians, Poles, and Hungarians, Galicia continued a Polish dependency from 1382 until the first partition of Poland in 1772, when it was acquired by Austria. See *Poland; Ukraine; European War*.

Galicia, one of the old provinces of Spain, situated in the north-west, and bounded by the Atlantic, by Portugal, and by the old provinces of Asturias and Leon. It is now divided into the provinces of Corunna, Lugo, Orense, and Pontevedra; area, 11,254 sq. miles. Its broken coast, which has a length of about 240 miles, lies open to the Atlantic, and there are several natural harbours, of which Ferrol is one of the finest naval ports in Europe. The surface is mountainous, and the proportion of good arable land limited; but fruit, particularly apples and pears, nuts, walnuts, and chestnuts, is abundant; and the culture of the vine is common in all the lower districts. The higher mountain slopes are generally covered with fine forests. The chief town is Santiago de Compostella. The natives (Gallegos) speak an uncouth patois, which other Spaniards scarcely understand. Pop. 2,153,284.

Galilee, in the time of Jesus Christ, the most northern province of Palestine. It was in some sense the cradle of Christianity, Nazareth, Cana, Capernaum, Nain, and other places being intimately associated with the life of Christ. The Jews, by way of contempt, called Christians, at first, *Galileans*. At present Galilee is one of the ten districts of Palestine.

Galilee, Sea of, also called the Lake of Gennesaret or Tiberias, a pear-shaped freshwater lake in Central Palestine, 12½ miles long by 7½ miles broad. On the east the shores are nearly 2000 feet high, deeply furrowed by ravines but flat along the summit. The whole basin is bleak and monotonous, and has a scathed volcanic look. At the time of Christ there were on its shores nine flourishing cities. The lake still abounds in fish, but the fishery is neglected.

Galilei, Galileo (1564–1642), Italian physicist. In 1589 he was made professor of mathematics in the University of Pisa, and in 1592 professor in Padua, where he continued eighteen years, his lectures acquiring European fame. Here he made the important discovery that the spaces

through which a body falls, in equal times, increase as the numbers 1, 3, 5, 7. To the telescope, which in Holland remained not only imperfect but useless, he gave a new importance. His most remarkable discovery was that of Jupiter's satellites (1610). He also detected the sun's spots, and inferred the rotation of the sun, and the inclination of its axis to the plane of the ecliptic. In 1611 he visited Rome for the first time, where he was honourably received; but on his return to Florence he became more and more involved in controversy. The monks preached against him, and in 1616 he found himself again obliged to proceed to Rome, where he is said to have pledged himself to abstain from promulgating his astronomical views. In 1632, however, with the permission of the Pope, he published a dialogue expounding the Copernican system as against the Ptolemaic. A congregation of cardinals, monks, and mathematicians, all sworn enemies of Galileo, examined his work, condemned it as highly dangerous, and summoned him before the tribunal of the Inquisition. The veteran philosopher was compelled to renounce upon his knees the truths he had maintained, especially concerning the earth's motion. At the moment when he arose, he is said (but this is doubtful) to have exclaimed, in an undertone, stamping his foot, "*E pur si muove!*" (and yet it moves!). He was eventually allowed to return to his residence at Arcetri, near Florence, where he employed his last years principally in the study of mechanics and projectiles. The results are found in two important works on the laws of motion, the foundation of the present system of physics and astronomy. Domestic troubles and disease embittered the last years of Galileo's life. A complete edition of his works appeared in 20 volumes at Florence, 1890–1909.

Gall, Franz Joseph (1758–1828), the founder of phrenology. After a series of comparisons of the skulls both of men and animals, he advanced the theory that it was possible to locate definitely twenty mental faculties. In 1810 he published with his friend Dr. Spurzheim the *Anatomie et physiologie du système nerveux en général, et du cerveau en particulier*; and in 1812 his own *Des dispositions innées de l'âme et de l'esprit, ou du matérialisme*. See *Phrenology*.



Gallas, a numerous and powerful Ethiopian race, chiefly inhabiting a territory in East Africa lying south of Abyssinia proper. They are members of the Hamitic race, and are closely akin to the earliest inhabitants of Egypt. Their language is spoken over a considerable area stretching south to the equator.

Galle, a seaport near the south-west extremity of Ceylon, on a low, rocky projecting point of land. It is well built and has a good harbour, with a depth at berths of 33 feet, and fine scenery adjoining. It is a coaling-station. The exports are tea, plumbago, coir, coco-nut oil, &c. Pop. 39,073.

Gall-fly, insects of the family Cynipidae, which form the disease products known as galls. The tumour or gall is due to the morbid action of an irritating fluid deposited with the egg of the insect. Oaks are especially liable to attack. The well-known 'oak apple' is caused by *Cynips quercus folii*; 'oak spangles' on the backs of leaves are due to *Neuroterus fumipennis* and other species. The shrubby oak (*Quercus infectoria*) of Syria is attacked by *C. galleæ tinctoriæ*, which gives rise to the hard gall or gall-nut which is chiefly used in commerce. The hairy gall of the rose, called a *bedeguar*, is the work of *Rhodites rosæ*. The larvæ in this, as in the oak gall, do not come out till the following spring. See *Galls*.

Galic Acid ( $C_7H_5O_6$ ), an acid occurring in gall-nuts, seeds of mango and certain other plants, is a decomposition product of tannic acid. It is much used in dyeing and in the manufacture of ink. When heated to 215° C. it yields pyrogallol. See *Ink*; *Dyeing*.

Gallican Church, a distinctive name applied to the Roman Catholic Church in France. The peculiarity of the Gallican Church and of Gallicanism consists not in any diversity of doctrine or practice from those generally held and observed by Roman Catholics in other countries, but in the maintenance of a greater degree of independence of the Papal see, more especially by denying the validity of many of the decretals issued since the time of Charlemagne, and refusing to allow the Pope to interfere with the civil jurisdiction of the State and the sovereign rights of the Crown. The freedom asserted in this respect was increasingly recognized by the Pragmatic Sanctions of 1269 and

1438, and was still more clearly established by the Quatuor Propositiones Cleri Gallicani (Four Propositions of the French Clergy), drawn up in convocation by the French clergy in 1682. Subsequently, and especially since the Vatican Council of 1870, the position of the Gallican Church towards the Popes has essentially changed, and the older Gallicanism may now be said to be represented by the Old Catholics of France.

Gallieni, Joseph Simon (1849-1916), French soldier. During the European War, in the critical days of Aug., 1914, when the French Government had to leave the capital for Bordeaux, Gallieni was appointed military governor of Paris, and organized the defence of the city. He was appointed Minister of War in Oct., 1915, but resigned in March, 1916, and died two months later.

Gallienus, Publius Licinius (c. 218-268), Roman emperor, associated with his father Valerianus until the capture of the latter by the Persians in A.D. 260, when Gallienus continued to reign alone. Though given up to pleasure, he defeated the Goths in Thrace and Postumus in Gaul, and forced Aureolus, whom the legions of Illyria had proclaimed emperor, to take refuge in Milan.

Galliffet, Gaston Alexandre Auguste, Marquis de, Prince de Martignes (1830-1909), French general. When the Commune was declared in Paris, he was sent to suppress the rising, and employed the most rigorous measures against the Communard prisoners. He was War Minister in 1899 in Waldeck-Rousseau's Cabinet.

Gallinule, a name for aquatic birds belonging to the family Rallidæ or rails, genera Gallinula and Porphyrus. They are good swimmers. The common gallinule, moor-hen, or water-hen (*G. chloropus*), is the only British species, and it has a wide range through Europe, Asia, and Africa. It is black, with a red frontal shield.

Gallipoli, a seaport of Southern Italy, in the province of Lecce, on an island in the Gulf of Taranto. It is fortified, and has a productive tunny fishery and a good harbour (accommodation for ships of 1000 tons), from which large quantities of olive-oil, agricultural products, &c., are exported. Pop. 30,000.

Gallipoli, a town of Turkey, on the peninsula of the same name at the north-east end of the Dardanelles. It was once

fortified, but is now in a generally dilapidated condition. It has manufactures of cotton, silk, and morocco leather, and two harbours, one formerly used as a station for the Turkish fleet, and the other for trade, chiefly in corn, wine, and oil. Pop. about 25,000.

**Gallipoli**, a European peninsula, anciently known as the Thracian Chersonesus. Cape Helles is the southern extremity of the peninsula, and the only good openings on the coast are Suvla Bay and Morto Bay. The interior is rugged, mountainous, and barren. Gallipoli is of immense strategic importance, but is now a demilitarized zone (Treaty of Lausanne, 1923). See *European War* (vol. iii, p. 71).

**Gallium**, a bluish-white metal of the aluminium group, discovered by spectrum analysis in 1875 by De Boisbaudran.

**Galliwasp**, the *Celestus occiduus*, a species of fat, brown lizard, common in the West Indies.

**Galloway**, a district in the south-west of Scotland, now regarded as embracing Wigtownshire and Kirkcudbright. It has given name to a breed of horses and one of cattle.

**Galls**, gall-nuts or nut-galls, are vegetable excrescences produced by the deposit of the egg of an insect in the bark or leaves of a plant. The galls of commerce are produced by a species of *Cynips* (see *Gall-fly*) in the tender shoots of the *Quercus infectoria*, a species of oak abundant in Asia Minor, Syria, and Persia. They are of various size and colour, and are extensively used in dyeing and in the manufacture of ink, and they are also frequently used in medicine. They are chiefly imported from Aleppo, Tripoli, and Smyrna. The Chinese galls, or *woo-pai-tsze*, are different, and are imported into Britain in considerable quantities.

**Galston**, a burgh of Ayrshire, Scotland, in a mining and agricultural district. There are manufactures of muslin and lace. Pop. (1931), 4601.

**Galsworthy**, John (1867–1933), British novelist and playwright. His career as author began with the publication of a volume of tales, called *The Villa Ruben*, in 1900. His best-known novels and tales are: *The Island Pharisees*, *The Country House*, *The Dark Flower*, *Beyond*, *Five Tales*, *Saint's Progress*, *Awakening*, *Tatterdemalion*. *The Man of Property* (1906), *In Chancery* (1920), *To Let* (1921) were

issued collectively as *The Forsyte Saga* in 1924. *The White Monkey* (1924), *The Silver Spoon* (1926), and *Swan Song* (1928) were issued collectively in 1929 as *A Modern Comedy*. His plays include: *The Silver Box*, *Joy*, *Strife*, *Justice*, *The Pigeon*, *The Skin Game* (1920), *A Family Man* (1921), *Loyalties* (1922), *Windows* (1922), *Escape* (1926), and *Exiled* (1929). He received the Order of Merit in 1929.

**Galt**, Sir Alexander Tilloch (1817–1893), son of John Galt (q.v.), Canadian financier and statesman. He entered the Canadian Parliament in 1849, and was Minister of Finance of the Dominion of Canada in 1867. From 1880 to 1883 he was High Commissioner of the Dominion in Britain.

**Galt**, John (1779–1839), Scottish novelist. His *Ayrshire Legatees* (1820), with its humorous descriptions of Scottish middle and low life, first indicated the true scope of his faculty, and it was followed by his *Annals of the Parish* (1821), *The Provost* (1822), *Sir Andrew Wyllie* (1822), and *The Entail* (1823). These were perhaps his best works, though his writings comprised about fifty novels, twenty dramas, and other works.

**Galt**, a town, Ontario, Canada, on the Grand River. It is served by the C.N.R. and the C.P.R., and amongst the principal industries are the manufacture of iron goods, woollens, and flour. Pop. 13,216.

**Galton**, Sir Francis (1822–1911), English traveller and anthropologist, grandson of Erasmus Darwin (q.v.). After graduating at Trinity College, Cambridge, he travelled to the White Nile, and subsequently (1850) explored Damara- and Ovampo-lands, then unknown countries. He published an account of his experiences in his *Narrative of an Explorer in Tropical South Africa*. His *Meteorographica* (1863) contained much original work in this branch of science. From 1869 he devoted himself largely to questions connected with heredity, and published the following important works: *Hereditary Genius: its Laws and Consequences* (1869), *Inquiries into Human Faculty and its Development* (1883), *Natural Inheritance* (1889), *Finger Prints* (1893), and *Finger Print Directory* (1895). He wrote also *Essays in Eugenics* (1909), and published *Memories of my Life* (1908).

**Galvani**, Luigi (1737–1798), Italian physician and physiologist. His fame rests

on his theory of animal electricity, enunciated in the treatise *De Viribus Electricitatis in Motu Musculari Commentarius*, published in 1791.

**Galvanic Battery.** See *Voltaic Cell*.

**Galvanized Iron**, a name given to sheets of iron coated with zinc by a non-galvanic process, the iron being first cleansed by the action of dilute sulphuric acid, and then plunged into a bath of melted zinc covered with sal ammoniac.

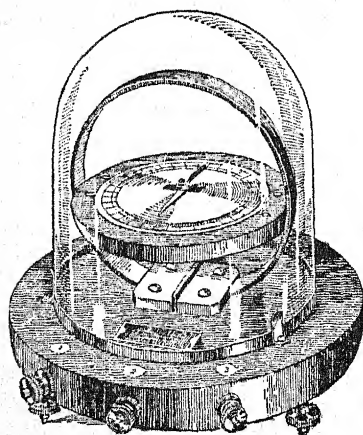
**Galvanometer**, an instrument employed to detect and measure electric

of turns of wire in the coil, and by using an optical method of measuring the angle of deflection. The 'needle' is cemented to the back of a light circular mirror about a centimetre in diameter. The mirror is suspended by a strand of silk at the centre of the coil. The position of the needle is found by reflecting the rays of a glow-lamp from the mirror to a horizontal scale pasted or etched on a strip of ground glass placed about 1 metre in front of the mirror. On passing a weak current through the galvanometer, the needle is deflected, and the spot of light moves along the scale. The instrument was devised and used by Thomson (Lord Kelvin) during the laying of the Atlantic cable. In the *moving coil galvanometer*, the current to be measured is led through a suspended coil, which thus becomes a magnet, and is deflected by a fixed permanent magnet. In the *string galvanometer*, the moving coil is replaced by a flexible silvered glass fibre or 'string' fixed at its ends.

The *ballistic galvanometer* is similar to the reflecting galvanometers, except that the needle or moving-coil is made relatively much heavier. The galvanometer primarily measures *quantities* of electricity, by the throw of the spot of light caused when the electricity is discharged through the galvanometer. It is employed to determine the magnetic field strength in the pole-gaps of electromagnets and dynamos, and the magnetic quality of steel; it is also used for comparing the E.M.F.'s of cells and the capacities of condensers. See *Ammeter*.—Cf. S. P. Thompson, *Electricity and Magnetism* (1915).

**Galveston**, a seaport of Texas, U.S.A., at the north-east extremity of Galveston Island, at the mouth of Galveston Bay. It is one of the most flourishing ports in the Gulf of Mexico, and has 30 feet of water alongside. Cotton is the most important export, and wheat, cotton-seed, and cotton-seed oil are the other principal items. Pop. 44,255.

**Galway**, a seaport of the Irish Free State in Connaught, capital of county of same name, at the mouth of the Corrib, in Galway Bay. It has numerous churches, three monasteries, and five nunneries. The chief exports are agricultural produce and marble. There are mills for sawing and polishing marble, a brewery, and a distillery. The largest vessels can find safe anchorage in the roadstead, and there



Tangent Galvanometer

currents. The term is generally confined to those laboratory instruments which depend for their action on the electromagnetic effect of the current. The *tangent galvanometer*, which is the simplest form of current-measuring instrument, consists of a circular coil of wire of one or more turns of known radius, with a compass-needle pivoted at the centre of the coil. The instrument is set up with the plane of the coil vertical and in the magnetic meridian. On passing a current through the coil, the needle is deflected from its position of rest: the strength of the current is proportional to the tangent of the angle of deflection. The *Sine* and *Helmholtz* galvanometers are modifications of the above form. A more sensitive current detector—the *mirror galvanometer*—is made by largely increasing the number

is dock accommodation for ships drawing 15 feet. Pop. (1926), 14,223.

Galway, a county of the Irish Free State on the Atlantic; area, 2375 sq. miles, of which one-eighth is under crops. In the north-west, or district of Connemara, it is rugged and mountainous; in the east, level but extensively covered with bog; and in the south, fertile and tolerably well cultivated, producing wheat, barley, and oats. Lough Corrib, which lies wholly within it, dividing the county into the east and west districts, is the third largest lake in Ireland. The minerals include lead, limestone, marble, and beautiful serpentine. The fisheries are valuable, but much neglected. The principal manufactures are coarse woollens and linens. Pop. (1926) 169,311.

Galway Bay, a large bay on the west coast of Ireland, between County Galway to the north and County Clare to the south. Across its entrance lie the Aran Islands.

Gama, Dom Vasco da (c. 1460-1524), Portuguese navigator. He sailed from Lisbon on 8th July, 1497, and, doubling the Cape, visited Mozambique, Mombaza, Melinda, and Calicut, returning to Lisbon in 1499. In 1502 he was placed at the head of a powerful fleet, with which he provided for the security of future voyagers by founding establishments at Mozambique and Sofala. He also inflicted signal reprisals on the town of Calicut, where the Portuguese residents had been massacred, and established the first Portuguese factory in the Indies. In 1524 he was appointed Viceroy of India by King John III, but his administration lasted only three months.

Gambeila, a trading station in the west of Abyssinia, on a tributary of the Sobat River. It is leased to the Sudan Government, and has steamboat communication with Khartoum from June to November.

Gambetta, Léon Michel (1838-1882), French orator and statesman. In 1863 he gained the leadership of the Republican party by his defence of Delescluze, a noted Republican. On the downfall of the Empire in 1870, the Government of National Defence was formed, in which Gambetta was nominated Minister of the Interior. The Germans having encircled Paris, he left that city in a balloon, and for a short time organized a fierce but vain resistance

against the invaders. After the close of the war he held office in several short-lived ministries, and in Nov., 1881, accepted the premiership. The sweeping changes proposed by him and his colleagues speedily brought a majority against him, and after a six weeks' tenure of office he had to resign. The accidental discharge of a pistol caused his death.

Gambia, a British Crown Colony and Protectorate in West Africa. The Crown Colony consists of the Island of St. Mary, on which Bathurst, the capital, stands; area, 4 sq. miles; pop. 9000. The Protectorate has an area of 4130 sq. miles and a population of 200,000, and forms a long, narrow strip surrounded by the French territory of Senegal. It includes the small kingdom of Barra, near the mouth of the river. The chief exports are ground-nuts, rubber, and palm kernels.

Gambia, a river of West Africa, rising in a mountainous district in Futa Jallon and flowing to the Atlantic, through French and British territory; length, about 700 miles. It is navigable for 300 miles by small vessels.

Gambier Islands, a group of small coral islands in the South Pacific, belonging to France. Mangareva, the largest island, has a Roman Catholic mission-station. The inhabitants of the group now number only 500, and the fertility of the soil is not taken advantage of. The fishing is good.

Gambling, or Gaming. In Great Britain gaming has been the subject of numerous enactments. Henry VIII made proclamation against certain games, including dice, cards, and bowls. By an Act of Charles II (1663) any person fraudulently winning money by gaming was to forfeit treble the amount. An Act of 1845, while repealing some of the previous Acts, and exempting games of mere skill, including billiards and dominoes, inflicts the penalty of £100 (afterwards increased to a maximum of £500) on any person keeping a gaming-house, with the alternative of six months' imprisonment. Persons playing or gaming in public places may be punished as rogues and vagabonds. Penalties are inflicted for keeping billiard or bagatelle tables without a licence. Lotteries and raffles are illegal (but art union lotteries are excepted). Persons fraudulently winning money by gaming shall be deemed guilty of



obtaining it by false pretences. No suit-at-law can be brought against a loser for money won at play or to recover money so lost, or to recover a deposit from a stakeholder; but this does not apply to prizes at any lawful sport. Later Acts provide that betting-houses shall be considered gaming-houses. The present state of the law in Great Britain is defined by the Street Betting Act of 1906. See *Betting*.

**Gamboge**, a concrete, vegetable, inspissated juice or sap, or gum-resin, yielded by several species of trees. The gamboge of European commerce appears to be mainly derived from *Garcinia Hanburii*, found in Cambodia, Siam, and in the southern parts of Cochin-China. This substance is contained chiefly in the middle layer of the bark of the tree; it is obtained by incision. Gamboge is used in painting, staining, lacquering, and in medicine. As a drug it is seldom administered alone.

**Game Laws.** Anyone is qualified to kill game who has taken out a proper inland revenue licence, and everyone must hold such a licence whether he is to kill game on his own land, or on that of another with his permission. The law differs somewhat in England, Scotland, and Ireland, but the animals specially designated as game are hares, pheasants, partridges, grouse, black-game, and bustards; while hares and rabbits are also spoken of as 'ground game'. No one is allowed to kill winged game during a part of the year called the *close season*, which for partridges is from 2nd Feb. to 31st Aug., for pheasants from 2nd Feb. to 30th Sept., for grouse from 11th Dec. to 11th Aug., for black game from 11th Dec. to 19th Aug. A person who kills game without a licence is liable to a penalty of £20. The duties on licences for killing or dealing in game are excise duties, and are regulated as follows: for a licence to each person for taking or killing any game whatever, if taken after 31st July and before 1st Nov., to expire on 31st July following, £3; if to expire on 31st Oct. of the same year, £2; from 1st Nov. to 31st July, £2; if for a continuous period of fourteen days alone, £1. A person holding a game licence does not require a gun licence.

**Gametes.** See *Ferns*; *Zygote*.

**Gandak**, a river of Northern India,

rising in the Himalayas and entering the Ganges; length, 400 miles.

**Gandia**, a town and port of Spain, in the province of Valencia, on the Alcoy. Silk and ribbons are the chief manufactures, and the exports include raisins, oranges, and wine. Pop. about 11,500.

**Gando**, a former sultanate of the Western Sudan, intersected by the Niger. It is most fertile, and has a pop. of about 5,500,000. Since 1898 the territory has been merged in the colonies of Nigeria, and in Dahomey and Upper Senegal.

**Ganges**, a river of India, one of the greatest rivers of Asia, rising in the Himalaya Mountains, in Garhwal state, and formed by the junction of two head-streams, the Bhagirathi and the Alaknanda, which unite at Deoprag. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, but the Alaknanda flows farther and brings a larger volume of water to the junction. At Hardwar, about 30 miles below Deoprag, the river fairly enters the great valley of India, and flows in a south-easterly direction till it discharges itself by numerous mouths into the Bay of Bengal, after a course of about 1700 miles. During its course it is joined by eleven large rivers (the Jumna, Son, Ramganga, &c.). During the rainy season the river overflows to an enormous extent. The Ganges basin has by the judicious construction of irrigation canals become one of the most fertile areas in the world. The Ganges delta has the Hooghly on the west, the Meghna on the east, and commences about 200 miles, or 300 miles by the course of the river, from the sea. Along the sea it forms an uninhabited swampy waste, called Sunderbunds. The westernmost branch, the Hooghly, is the only branch commonly navigated by ships. The Meghna, or main branch, on the east is joined by a branch of the Brahmaputra. Some of the principal cities on the Ganges and its branches, ascending the stream, are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad, Cawnpore, and Farrukhabad. The Ganges is navigable for boats of a large size nearly 1500 miles from its mouths, and it forms a great channel for traffic. It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days.

**Ganges Canal**, Upper, a lateral canal in Northern India (United Provinces), constructed for purposes of irrigation and supplementary navigation.

**Gangpur**, a native state of Bengal, in Chota Nagpur, consisting mainly of hills, forest, and jungle. Area, 2492 sq. miles; pop. 74,000.

**Gangrene** is the death of a considerable area of body tissue. It is known as dry gangrene when the tissues involved were previously drained of fluid, and moist gangrene when the part is full of fluid. In the latter condition putrefaction frequently appears, as the moisture is favourable to the growth of putrefactive germs. Amputation or removal of the affected part is necessary. Anything that lowers or destroys the vitality of living tissues favours the development of gangrene, as seen by its appearance in certain diseases, in the senile and debilitated, or following the application of certain substances to the skin.

**Ganister**, or **Crowstone**, a hard sandstone found in Yorkshire, Derbyshire, Lancashire, &c. Ground down, it is used to make furnace-hearths, and, mixed with clay, to line Bessemer converters.

**Ganjam**, a town of India, in the Madras Presidency, near the coast of the Bay of Bengal.—The district, one of the five Circars, is one of the most productive under the Madras Presidency. Area, 8380 sq. miles; pop. 1,896,803.

**Gannet**, the solan goose, a bird of the genus *Sula* (*S. bassana*), the type of a

a dirty white, inclining to grey; the eyes a pale yellow, surrounded by a naked skin of a fine blue colour; the bill straight, 6 inches long, and furnished beneath with a kind of pouch. The gannets are birds of passage, arriving in Great Britain about March and departing in August or September. In the breeding season they retire to high rocks on unfrequented islands. The female lays only one egg. The young remain in the nest until nearly their full size.

**Ganoids**. See *Scales*.

**Gantok**, chief town of Sikkim, India. It stands among the Himalayas.

**Gantung Pass**, a wild pass in the Western Himalayas between Bussahir in the Punjab and Tibet. It is covered with perpetual snow, and is 18,295 feet in height.

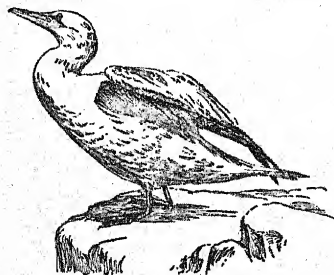
**Ganymede**, in Greek mythology, the son of Tros and of Callirrhoe. Zeus sent his eagle to carry him off from Mount Ida to Olympus, where he held the office of cup-bearer to the immortals in succession to Hebe.

**Gapes**, a disease of fowls and other Rasorial birds, arising from the presence in the windpipe of small parasitic worms (*Fasciola trachealis*) which cause the bird continually to open its beak.

**Garcilaso de la Vega** (1500–1536), Spanish poet. He was made commander of thirty companies of infantry in 1536, and was mortally wounded in attempting to scale a tower near Fréjus. His name is associated with that of his contemporary Boscán in the impetus given to Spanish literature by the imitation of the Italian poetic style as exemplified in Petrarch, Ariosto, and Sannazaro. His works, which consist of eclogues, epistles, odes, songs, and sonnets, are graceful and musical. His poems were first published in 1543.

**Garcilaso de la Vega** (c. 1540–c. 1620), Spanish historian. His great work on the history of Peru is in two parts: the first entitled *Los Comentarios Reales que tratan del Origen de los Incas* (Lisbon, 1609); the second, the *Historia general del Peru* (Cordova, 1616). He wrote also *Historia de la Florida* (Lisbon, 1609).

**Gard**, a department of Southern France, abutting on the Gulf of Lions; area, 2270 sq. miles. The north and west are occupied by the Cevennes and their branches, sloping gradually into a fertile plain, the coastline of which is so low as to form extensive



Gannet (*Sula bassana*)

family (Sulidae) of aquatic birds, related to cormorants and pelicans. It is about 3 feet in length, and 6 feet in breadth of wings from tip to tip; the whole plumage

swamps and salines. The drainage belongs partly to the Garonne, but chiefly to the Rhône, which forms the east boundary. Within the department the chief river is the Gard. The rich lower districts produce a large quantity of wine, and are noted for silk-culture. Large quantities of salt are made, and lead, coal, iron, &c., are worked. There are silk, woollen, and cotton manufactures. Nîmes is the capital. Pop. (1926), 402,601.

**Gard, Pont du**, a fine Roman aqueduct in Gard, 10 miles from Nîmes, joining two mountains and passing over the Gardon. It has three tiers of arches, and is 160 feet high.

**Garda, Lake**, the largest lake in Italy, belonging to the Alpine region, 33 miles long, 3 to 11 miles broad, greatest depth, 902 feet. The Sarcia, almost its only affluent, enters at its north end, and it is drained by the Mincio. It is well stocked with fish. Steamboats ply on it, and its shores are covered with villas.

**Garde Nationale**, a guard of armed citizens instituted at Paris on the 13th of July, 1789. Acting as a Royalist and reactionary force, it was crushed by Napoleon in 1795. It was reorganized by the Directory and by Napoleon, but was dissolved by a Royal Ordinance in 1827. Under Louis Philippe it was resuscitated in its old form, and contributed to his overthrow. In 1870 the National Guard of Paris was again formed for the defence of the city against the Prussians. The resistance of a section of the guard to the decree of disarmament issued under M. Thiers led to the insurrection of the Commune, at the close of which the guard was declared dissolved by the National Assembly (1871).

**Garden Cities** are the result of an attempt to remedy the evils of overcrowding in large towns, and so to give the workers a better opportunity of bringing up their families in good surroundings. One of the earliest was the model village of Port Sunlight, started in 1888 by Messrs. Lever Bros. for their employees. The houses are let at low rents, only sufficient to cover the cost of repairs and maintenance, and the village is arranged on 'town-planning' lines. Each house has a garden, and there are all the necessary numerous public buildings. Bournville, started by Mr. George Cadbury in 1879, is another example. Here the houses

are not reserved for the workers at the Bournville Cocoa Factory, but are available for all workers. The houses must have gardens. Public buildings are the schools, Ruskin Hall, and the meeting-house. An interesting feature of Bournville life is the village council, a committee elected by the householders to further the interests of the villagers. The garden village at Earswick, near York, and Woodlands, near Doncaster, are other examples. The first garden city proper is the outcome of a scheme outlined by Mr. Ebenezer Howard in 1898. An estate of nearly 4000 acres was acquired at Letchworth, near Hitchin, in 1903 by the Garden City Association, Ltd. Water and sewage arrangements were seen to at once, and other necessities and facilities followed. Several firms have moved their works there. Each dwelling has its own garden. A feature of many of these schemes and also of garden suburbs is provision for co-operative ownership and administration of the estate by the tenants. The erection of garden suburbs is a similar movement, but different in that they are not intended to be complete economic entities. The best-known garden suburb is that at Golders Green, and the post-war scheme has been carried out successfully at Welwyn, in Hertfordshire. The movement has spread from England to the Continent.—Cf. C. B. Purdom, *The Garden City: a Study in the Development of a Modern Town*.

**Gardenia**, a genus of trees and shrubs, nat. ord. Rubiaceæ, natives of tropical Asia and Africa, with white flowers, two species of which, *G. florida* and *G. radicans*, are well known in Britain as Cape jasmine.

**Garden Island**, an island in Sydney Harbour, New South Wales, the chief base of the Royal Australian Navy.

**Garden-spider**, also called **Diadem**, or **Cross-spider**, the *Epeira diadema*, a common British spider the dorsal surface of which is marked with a triple yellow cross. It forms a beautiful geometric web.

**Garden-warbler** (*Sylvia hortensis*), a migratory song-bird visiting Britain from the end of April to September. It is rather less than 6 inches long, the head and upper surface greenish-brown, the under surface brownish-white.

**Gardinas** (formerly *Grodno*), a town and province the possession of which is disputed by Lithuania and Poland. They

are under Polish occupation. The town manufactures cloth and tobacco and has a population of 61,600.

**Gardiner**, Samuel Rawson (1829-1902), English historian. He specially devoted himself to the period of English history beginning with the accession of James I, and gave a full and impartial account of the events of the time, based on the original documents. He also wrote: *Cromwell's Place in History*, *Oliver Cromwell*, and a *Student's History of England*.

**Gardiner**, Stephen (1493-1555), English prelate. He was appointed Secretary of State, and in succession Archdeacon of Norwich and Leicester, and Bishop of Winchester. Although he supported the king in renouncing the authority of the Pope, he opposed the doctrines of the Reformation, and took an active part in the passing of the Six Articles and in the prosecution of Protestants. During the reign of Edward he was imprisoned and deprived of his bishopric, but Mary restored him to his bishopric, and appointed him Lord Chancellor. He officiated at her coronation and marriage, became one of her chief advisers, and took an active part in the persecutions at the beginning of the reign.

**Gardner**, Ernest Arthur (1862- ), English archaeologist. In 1910 he was elected first public orator of London University. His works include: *Introduction to Greek Epigraphy* (1887), *A Handbook of Greek Sculpture* (1896-1897), *Ancient Athens* (1902), *The Inscriptions of Attica* (1905), *Religion and Art in Ancient Greece* (1910), and *The Art of Greece* (1925).

**Gareloch**, an arm of the Firth of Clyde, running from Helensburgh to Garelochhead in Dumbartonshire. There are several holiday-resorts on its shores, and the loch itself affords good safe anchorage for the largest vessels. Many ships lie up here.

**Garfield**, James Abram (1831-1881), twentieth President of the United States. In 1880 he was elected to the Senate, and in the same year became President of the United States. Many reforms seemed about to be inaugurated, when he was shot by a disappointed office-seeker named Guiteau in the railway station at Washington. He lingered eighty days, dying at Long Branch.—Cf. Lossing, *A Biography of James A. Garfield*.

**Garfish**, the name applied (1) to a long slender fish with green bones, about 2 feet long, appearing in English waters in

summer; (2) other species of *Belone*; and (3) to a ganoid fish of the genus *Lepidosteus*.

**Gargantua**. See *Rabelais*.

**Garhwal**, a district of India, in the United Provinces, bounded on the north by Tibet, east by Kumaun, south by Bijnor district, and west by the Garhwal state; area, 5500 sq. miles; pop. 430,000. There are good roads, and a considerable trade with Tibet in grain, cloth, and chillies.

**Garhwal**, or **Tehrri**, a native Indian state under British protection, west of the district of the same name; area, 4180 sq. miles; pop. 318,414. Chief town, Tehri; chief rivers, the Alaknanda and other headwaters of the Ganges. A large part is covered with forests, which include valuable *deodar* tracts, leased to the British Government in 1864.

**Garhwalis**, the inhabitants of a hilly tract of country in the Lower Himalayas. Garhwalis are small lightly-built men, and furnish a two-battalion regiment to the Indian army. As soldiers they are intelligent, law-abiding, and loyal. They are Hindus, and are capable of standing great fatigue and showing the maximum of endurance on little food.

**Garibaldi**, Giuseppe (1807-1882), Italian patriot. In 1834 he became a member of the 'Young Italy' party, and being condemned to death for his share in the schemes of Mazzini, escaped to Marseille, and finally went to South America. In the service of the Republic of Rio Grande against the Brazilians he became known as a brilliant leader. In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians. In the spring of 1849 he proceeded to Rome to support Mazzini's republic. He was appointed to command the forces, but the odds were overwhelming, and after a desperate defence of thirty days Garibaldi escaped from Rome with 4000 of his followers. In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the King of Naples, recrossed to the mainland and occupied Naples, where he was proclaimed Dictator of the Two Sicilies. He readily acquiesced in the annexation of the Two Sicilies to Italy, and, declining all honours, retired to his home in Caprera. In 1862 he entered



Calabria with a small following, but was taken prisoner at Aspromonte by the Royal troops. He was soon released, however. In 1867 he was defeated near Mentana by the French and Pontifical troops. In 1870 he gave his services to the French Republican Government against the Germans, and with his 20,000 men rendered valuable assistance in the south-east. The latter part of his life was spent at Caprera.

**Garigliano**, a river of South Italy, formed by the junction of the Liri and Sacco near Pontecorvo. After a course of 40 miles it falls into the Gulf of Gaëta.

**Garlic** (*Allium sativum*), a hardy perennial allied to the onion, indigenous to the south of Europe, and forming a favourite condiment amongst several nations. It has a strong penetrating odour, and a pungent acrid taste.

**Garnet**, a group of mineral silicates with a general formula of  $R_3''R_3'''(SiO_4)_3$ ,  $R''$  being iron, calcium, magnesium, or manganese, and  $R'''$  iron, aluminium, or chromium. *Almandine*, iron aluminium garnet, is a red species very common in altered argillaceous rocks. When translucent, it forms part of the *precious garnet* used as a gem. *Pyrope*, magnesium aluminium garnet, is also known as *precious garnet*, and has been obtained in large quantities from Bohemia. The 'cinnamon stone' of Ceylon is *grossularite*, a yellowish or red-brown calcium aluminium garnet. *Uvarovite*, calcium chromium garnet, is emerald-green. The hardness of garnet makes it a suitable gem-stone.

**Garnett**, Richard (1835-1906), English writer. He was for some years Keeper of Printed Books in the British Museum. His works include: *Io in Egypt, and other Poems* (1859); *Relics of Shelley; Idylls and Epigrams*, republished as *A Chaplet from the Greek Anthology; The Age of Dryden* (1895); *William Blake, Painter and Poet* (1895); *Essays in Librarianship and Bibliography* (1899).

**Garnishment**. This is an order at the instance of a creditor inhibiting a third party who is known as 'the garnishee', and who is in possession of goods belonging to the debtor, from handing over the goods or making payment of the money pending a settlement of the creditor's claim.

**Garofalo**, Benvenuto (properly *Benvenuto Tisio da Garofalo*) (1481-1559), Italian historical painter.

**Garo Hills**, a district of India, forming the south-western corner of Assam; area, 3270 sq. miles. It is a mountainous and forest region, exporting cotton and forest products. The native Garos are a robust and active race. Pop. about 140,000.

**Garonne**, a river of South-West France, rising in the Spanish Pyrenees; length, about 350 miles. It enters France and flows north-west to the Atlantic, receiving amongst its tributaries the Save, Tarn, Lot, and Dordogne. After being joined by the Dordogne it changes its name to the Gironde. It is navigable on the descent from St. Martory, and both ways from Toulouse. The Canal du Midi, joining it at Toulouse, forms a communication between the Atlantic and the Mediterranean.

**Garonne, Haute**, a department, south of France, one of the five separated by the Pyrenees from Spain. It is traversed from south to north by the higher reaches of the Garonne and for about 26 miles by the Canal du Midi. Cereals and wine are largely exported. Hemp, flax, oranges, and tobacco are also much grown. The principal mines are lead, copper, coal, antimony, iron, and zinc, and a fine marble is quarried. There is a large trade with Spain. The capital is Toulouse. Area, 2457 sq. miles; pop. (1926), 431,505.

**Garrault**, a small state in the Central Provinces, India; area, 25 sq. miles; pop. 6000.

**Garrick**, David (1717-1779), English actor. In 1741 he joined Giffard's company at Ipswich under the name of Lyddal. At Giffard's theatre in Goodman's-fields he achieved a great success as Richard III, and in 1742 was not less successful at Drury Lane. In 1745 he became joint manager with Thomas Sheridan of a theatre in Dublin, and after a season at Covent Garden (1746) purchased Drury Lane in conjunction with Lacy. From this period may be dated a revival of Shakespeare, and a reform both in the conduct and licence of the drama. In 1763 Garrick visited the Continent for a year and a half. He had already written his farces of *The Lying Valet*, *Lethe*, and *Miss in her Teens*; and in 1766 he composed, jointly with Colman, the excellent comedy of *The Clandestine Marriage*. After the death of Lacy, in 1773, the sole management of the theatre devolved upon Garrick until 1776, when he sold his moiety of the theatre for £37,000,

performed his last part, Don Felix in *The Wonder*, for the benefit of the theatrical fund, and bade an impressive farewell to the stage.—Cf. *Lives* by P. Fitzgerald, J. Knight, and James Smyth.

Garrison, William Lloyd (1805–1879), American journalist and founder of the anti-slavery movement in the United States. With Benjamin Lundy, a Quaker, he started the paper called the *Genius of Universal Emancipation* (1829), his denunciations of slave-traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, and started the *Liberator* (1831). In 1832 appeared his *Thoughts on African Colonization*, and in the same year he established the American Anti-Slavery Society. His principles made steady progress until 1865, when the Anti-Slavery Society was dissolved with its work accomplished.

Garrot, the French name for ducks of the genus *Clangula*, having the bill shorter than the head, widely distributed over the temperate regions of Europe and America. The golden-eye (*C. glaucion*) is a common species in Britain.

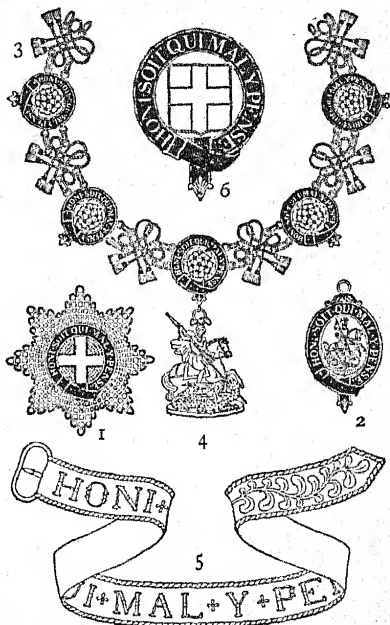
Garrote, a Spanish method of execution by strangulation, the victim being placed on a stool with a post or stake (Sp. *garrote*) behind, to which is affixed an iron collar with a screw. The collar is made to clasp the neck of the criminal, and is drawn tighter by means of the screw till life becomes extinct.

Garstang, a market town, North Lancashire, England, on the Wyre. Lying on the Great North Road, it used to be an important place in the coaching days. Pop. (rural district) (1931), 11,562.

Garston, a port in Lancashire, now part of Liverpool city. Salt is the chief manufacture. The docks of the London, Midland and Scottish Railway are at Garston.

Garter, Order of the, the highest and most ancient order of knighthood in Great Britain. The origin of the order, though sometimes assigned to Richard I, is generally attributed to Edward III in 1344. The statutes of the order have been repeatedly revised. The original number of knights was twenty-six, including the sovereign, who was its permanent head; and this number is still retained, except that extra knight companions may be admitted as supernumerary members. The peculiar emblem of the order, the garter (5), made of dark-blue velvet edged with gold, is

worn on the left leg below the knee. The mantle is of blue velvet lined with white taffeta, with (6) a representation of the garter encircling the cross of St. George on an escutcheon argent embroidered on the left shoulder. The collar of gold (3)



Insignia of the Order of the Garter

consists of knots alternating with garters enclosing roses, with the badge of the order, called the George (4), pendent from it. The lesser George (2) is worn on a broad blue ribbon over the left shoulder, resting on the right hip. A star (1) is worn by the knights, on the left side, when not in the dress of the order.

Garter King of Arms, the head of the heraldic establishment in England, consisting of three kings of arms—Garter, Clarenceux, and Norroy. The duties of the Garter King of Arms are principally to grant heraldic supporters, to arrange royal funerals, and to present the Order of the Garter to foreign princes.

Garth, Sir Samuel (1661–1719), English physician and poet. A division among the medical profession on the establish-

ment of a dispensary for the metropolitan poor was the occasion of his successful mock-heroic poem *The Dispensary* (1699). He wrote much in verse and prose, including translations.

**Gartok**, the chief town of Western Tibet. It became a trade mart with a British commercial agent in 1904.

**Garua**, a town in the former German territory of Cameroon, West Africa, now mandated to France. It is on the Benue River, and is an important station on the Benue route to the Niger. Pop. 500,000.

**Gary**, a town of Indiana, U.S.A., at the head of Lake Michigan. Gary is the greatest steel-producing city in the world. Pop. 17,000.

**Gascoigne**, George (1535–1577), English poet. He is chiefly remembered for his blank-verse satire *The Steele Glas* (1576), and the *Complaynt of Philomene*, a rhyming elegy (1576), but he wrote two or three comedies and tragedies. The best known of his comedies is *Supposes*.

**Gascony**, an old division of France, between the Garonne, the sea, and the Pyrenees. The Gascons are of mixed Basque and Gothic descent.

**Gascoyne**, a river of Western Australia, rising in the Carnarvon Range, and falling after a course of 300 miles into Sharks Bay.

**Gas Engine**. See *Internal-combustion Engines*.

**Gases, Properties of**. The characteristic features which distinguish a gas from a liquid or a solid have been stated under *Fluid*. For every substance there is a certain temperature, called its *critical* temperature, above which the substance cannot exist as a liquid or a solid, no matter how great a pressure is applied to it. Certain gases used to be called the *permanent* gases, the chief being oxygen, air, carbon monoxide, nitrogen, and hydrogen. The critical temperature of these is so low that they were never found occurring except in the gaseous state. Now, however, with improved means of obtaining very low temperatures, all gases have been liquefied and even in fact solidified (see *Liquefaction of Gases*). The *Laws of Gases*, satisfied approximately by all gases, are: (1) *Boyle's* (or *Mariotte's*) *Law*. The product of the pressure and volume of a gas is constant when the gas, its mass, and its temperature are given. (2) *Charles's* (or *Gay-Lussac's*) *Law*. Every gas expands for a rise of temperature of 1° C.

by the same fraction of its volume at 0° C., the pressure being constant. The fraction is 1/273 nearly. (3) *Avogadro's Law*. At given temperature and pressure, equal volumes of all gases contain the same number of molecules. (4) *Joule's Law*. The internal energy of a given mass of a gas is a function of its temperature only. See *Thermometer; Heat; Temperature; Thermodynamics; Diffusion; Solution; Ionization*.

**Gaskell**, Elizabeth Cleghorn (1810–1865), English novelist. She was brought up by an aunt at Knutsford, in Cheshire (the original of the village in her story of *Cranford*), and married in 1832 the Rev. William Gaskell, a Unitarian minister at Manchester. Her first work of importance, *Mary Barton*, appeared in 1848. *Lizzie Leigh*, *Cranford*, and other tales appeared at various times in *Household Words*, in which also she wrote *North and South*, a Yorkshire tale. In 1857 appeared her admirable *Life of Charlotte Brontë*, and in 1860 *Sylvia's Lovers*. *Wives and Daughters* appeared posthumously in 1866.

**Gas Manufacture**. There are two chief kinds of gas used for fuel. The first and most common is 'town's gas', which is composed entirely of coal-gas, or partly of coal-gas and partly of water-gas, which may or may not be carburetted with oil-gas; and the second is natural gas, which is not known in England except in very small quantities.

Coal-gas has a specific gravity of 0.44, and it is made up of the following percentages by volume:

Hydrogen	.. ..	48.49	} Combustible and illuminant.
Marsh gas or methane	.. ..	35.90	
Light-yielding hydrocarbons	.. ..	3.83	
Carbon monoxide	.. ..	6.61	} Inert gases.
Carbon dioxide	.. ..	0.12	
Nitrogen	.. ..	5.05	

When mixed with air in the proportion of one part of gas to anything from five to fifteen parts of air, it becomes explosive. If there be less than five parts of air, the mixture will burn, not explode; while if it contain more than fifteen parts of air, it is too weak either to burn or explode.

Among early experimenters on gas and coal distillation were Van Helmont, Boyle, Thomas Shirley, John Clayton, de Gensanne, and Murdock. The last-named in 1792 lit up his house in Redruth by means of gas. Later he erected a gas apparatus on a large scale in his firm's Soho foundry

at Birmingham. In 1802 Lebon successfully lit his house in Paris by gas distilled from wood. The application of gas to the general illumination of the community's streets and highways was introduced by Winsor. He came to London, and it was largely due to his enterprise that in 1812 a Royal Charter was granted to a company for the lighting of certain streets in Westminster. The gas-meter, invented in 1815 by Samuel Clegg and put into practical use ten years later, solved the initial difficulty of supply, and overcame the problem of checking the consumption of individual users. A revolution in the whole theory

for the single-ended type, and 20 feet when open at both ends. They are fixed together in sets, which are heated by the furnace or furnaces. Retorts are generally horizontal, but they are sometimes inclined at an angle of  $30^{\circ}$  or so, and in some of the most modern systems of carbonizing the retort is vertical.

The gaseous matter is in its early progress laden with aqueous and tarry vapours, which it is necessary to remove in order to purify the gas in the first place, and, in the second place, to recover the by-products. Passing from the retort up the ascension-pipe, the gas passes through

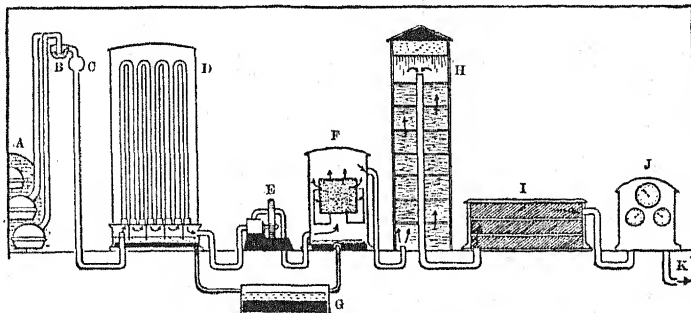


Diagram of Gas-making Plant

A, Retorts. B, Hydraulic main. C, Foul main. D, Condenser. E, Exhaust pump. F, Washer. G, Tar well. H, Scrubber. I, Purifier. J, Meter. K, To gasholder.

and practice of gas-lighting was brought about by the invention of the incandescent gas-mantle in 1885 by the Austrian von Welsbach (see *Mantle*).

At first gas was regarded as an illuminant solely. About the middle of last century it began to be used as a heating agent. Since the introduction of the gas-mantle, the heating effect has greatly increased in importance. This was recognized by the Gas Regulation Act, 1920, which substituted a thermal or calorific standard for the illuminating power standard which had previously been in use. Gas is now charged for, not by the cubic foot but by the 'therm', a heat unit equivalent to 100,000 British Thermal Units.

**Gas Manufacture.**—In a thoroughly up-to-date gasworks the crude coal is placed in fire-clay retorts. These retorts have internal dimensions of 21 inches by 15 inches, and are generally 10 feet in length

a hydraulic main (B in illustration) into a condenser (D). In passing through the condenser the gas is slowly reduced to a lower temperature, and thus the aqueous vapour condenses into water, heavily charged with ammonia, and this water proceeds to absorb sulphuretted hydrogen and carbonic acid from the gas, the heavier tarry vapours condensing at the same time into tar. The ammoniacal liquor is at one point drained off into an underground tank, while the tar, which separates from the liquor by gravity, is drained off into another tank. The next stage is the passage through the exhauster E (a pump for drawing off the gas from the retorts and so reducing the pressure on them), and then into the washer F, the object of which is to absorb the ammonia and partly further to condense what tarry vapours are still left in its composition. In the following stage the gas undergoes a scrubbing



process, where the last traces of ammonia are extracted. From the scrubber (ii) the gas passes into the purifier (i), where the greater part of the carbonic acid and the sulphur compounds are removed, and then finally it is conveyed by a pipe (κ) into the gas-holder.

The most important by-product is coke, which is the solid residue of the distilled coal. The second main by-product is tar, from the distillation of which an enormous number of subsidiary products is produced. A third by-product is ammoniacal liquor, which by the application of sulphuric acid produces the well-known and invaluable artificial manure and fertilizer sulphate of ammonia. Another by-product is cyanogen liquor, from which prussic acid is derived, as well as the valuable pigment known as Prussian blue.—BIBLIOGRAPHY: Walter Hole, *The Distribution of Gas*; Thomas Newbigging, *Handbook for Gas Engineers and Managers*; Charles Hunt, *A History of the Introduction of Gas Lighting*.

Gaspé, a district of Canada, province of Quebec, on the south of the St. Lawrence estuary, washed by the Gulf of St. Lawrence, of which Gaspé Bay is an inlet. The fisheries are valuable. Gaspé, the seaport, can accommodate vessels of all sizes.

Gassendi, Pierre (1592-1655), French philosopher and mathematician. He strenuously maintained the atomic theory, in opposition to the views of the Cartesians, and, in particular, asserted the doctrine of a vacuum. His works include: *De Vita, Moribus et Doctrina Epicuri* (1647), and *Syntagma philosophiæ Epicuri* (1649), as well as lives of Tycho Brahe, Copernicus, Peiresce, and Regiomontanus (Johann Müller).

Gastein, a watering-place in Austria, 3000 feet above the sea, 48 miles south of Salzburg, with thermal springs.

Gasteropods (Gasteropoda), a class of molluscs, consisting of animals inhabiting a univalve shell, although some of the group are wholly destitute of a shell. The class is divided into four sub-classes. (1) Amphineura: chitons, and some other primitive forms. (2) Prosobranchia: sea-snails with gills in front of the heart, as whelks, periwinkles, top-shells, cowries, &c. (3) Opisthobranchia: sea-snails and sea-slugs with gills — when present — behind the heart, as bubble-shells (Bulla), sea-hare (Aplysia), and the pelagic sea-butterflies (Pteropoda). (4) Pulmonata:

land and freshwater snails, and land-slugs, breathing by lung-like organs.

Gaston de Foix, Duke of Nemours (1489-1512), French soldier. At the age of twenty-three he routed a Swiss army, drove the Pope from Bologna, and won the battle of Ravenna, but was killed.

Gastornis, a large fossil bird, imperfectly known, remains of which have been discovered in the Lower Eocene deposits of Meudon, near Paris, and in the London Clay of England.

Gastromycetes, the highest class of Basidiomycetous Fungi, including, among other types, the puff-balls (Lycoperdon, Scleroderma), earth-stars (Geaster), bird's-nest fungi (Nidulariaceæ), and stinkhorns (Ithyphallus, Clathrus).

Gastrula, in embryology, that stage in the development of multicellular animals in which the embryo has the form of a two-layered sac enclosing a central cavity which communicates with the outside by means of an opening called a *blastopore*.

Gates, Horatio (1728-1806), American officer during the Revolutionary War. At the head of the American army of the north he compelled the British general, Burgoyne, to surrender his whole army at Saratoga (1777). In 1780, after the capture of General Lincoln, Gates received the chief command of the southern districts, but was defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and tried by court-martial, but was finally acquitted, and reinstated in his command in 1782.

Gateshead, a borough, England, county of Durham, on the right bank of the Tyne, opposite Newcastle, of which it is practically part, being connected with it by three bridges. Its industries are much the same as those of Newcastle, including large engineering and iron works, the making of glass and chemicals, and ship-building. In the vicinity are quarries from which the celebrated 'Newcastle grindstones' are obtained, and numerous collieries. Pop. (1931), 122,379.

Gatineau, a river of Canada, Quebec Province, the largest affluent of the Ottawa, rising in some lakes and flowing into the Ottawa nearly opposite Ottawa City. Its waters are well stocked with fish.

Gatling-gun. See *Machine-gun*.

Gatooma, one of the most flourishing towns in Rhodesia. It is in a rich agri-

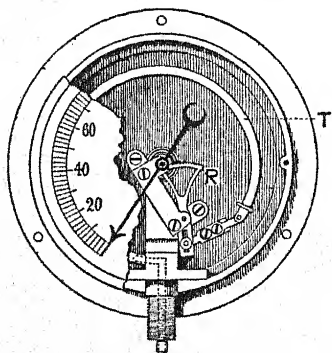
cultural country, and gold and scheelite are extensively worked in the vicinity. Pop. 1200 (500 whites).

**Gatun**, a town in the Panama Canal Zone, with locks and a large dam.

**Gauchos**, natives of the pampas of the La Plata countries in South America, of Spanish descent with only slight Indian admixture. The race is noted for horsemanship and the use of the lasso.

**Gauden**, John. See *Eikon Basilike*.

**Gauge**, a standard of measurement. As applied to railways, gauge is the distance between the two lines of rails forming the way, the ordinary or British gauge being 4 feet 8½ inches. The 'broad gauge' of the Great Western Railway of England was 7 feet. The Irish gauge is 5 feet 3 inches, the Indian and Spanish gauge 5 feet 6 inches. Gauge is also the name applied to contrivances for measuring any special dimensions, such as the wire-gauge, a plate of steel, with notches of different widths cut on the edge and numbered.



Bourdon Steam-pressure Gauge

T, Metal composition tube of elliptical section one end of which is soldered into a boss by which the pressure is admitted to the interior of the tube, while the other end is closed by a cap. When pressure is admitted to the tube the elliptical section has a tendency to change to the circular form. Consequently the tube tends to straighten, and the free end of the tube moves outward. This movement is multiplied and communicated to the pointer by a toothed quadrant gearing R.

**Gauge, Steam**, an instrument for indicating the pressure of the steam in a boiler or other vessel (see illustration).

**Gauge, Water, or Gauge Glass**, is a gauge for indicating the level of the water in a boiler. It consists of a glass tube

which is attached by a brass or gun-metal fitting at each end to the boiler. One end of the glass tube communicates with the steam-space, and the other end with the water-space of the boiler, so that the water in the glass tube is at the same level as the water in the boiler.

**Gauguin**, Paul (1848-1903), French painter. He became the chief figure of the Pont-Aven group, and developed a highly individual and characteristic art. In 1891 he went to Tahiti, where, except for a short return to France, he spent the rest of his life. His work is marked by a bold simplification of natural forms, decorative design, and the use of brilliant, arbitrary colour.

**Gaul**, or **Gallia**, in ancient geography, the country of the Gauls, the chief branch of the great original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Eventually the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Caesar, about the middle of the first century B.C., found Transalpine Gaul divided into three parts: (1) Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; (2) Gallia Celtica, Celtic Gaul, from the Garonne to the Seine and Marne; (3) Gallia Belgica, Belgic Gaul, in the north, extending to the Rhine.

**Gault**, in geology, a series of stiff, but sometimes calcareous, clays, varying in colour from a light grey to a dark blue, occurring between the Upper and Lower Greensands of the Cretaceous system of England.

**Gaur**, or **Gour**, one of the largest and fiercest members of the ox tribe (*Bos gaurus*), found in India, Burma, and the Malay Peninsula. It is remarkable for the extraordinary elevation of its spinal ridge, the absence of a dewlap, its white 'stockings', and its very thick hide.

**Gauss**, Karl Friedrich (1777-1855), German mathematician. In 1807 he became professor of mathematics and director of the observatory at Göttingen, a position which he held till his death. He was pronounced by Laplace to be the greatest

mathematician in Europe. His chief works were the *Disquisitiones Arithmetice* (1801), *Theoria Motus Corporum Coelestium* (1809), *Intensitas Vis Magnetice Terrestris* (1833), *Dioptrische Untersuchungen* (1841), and *Untersuchungen über Gegenstände der höheren Geodesie* (1844).

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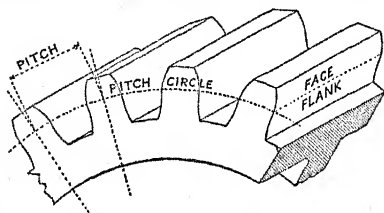
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When two simple gears work in series so that the motion *a* is transformed by one gear into a motion *b*, and the motion *b* is transformed by a second gear into a motion *c*, the compound train is called a *double-reduction gear*.

When the two axes are at right angles, the teeth lie on a conical surface, and the ends of the teeth are roughly at 45° to the plane of the wheels. Such trains are called *bevel-wheels*.

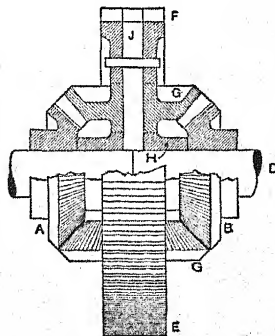
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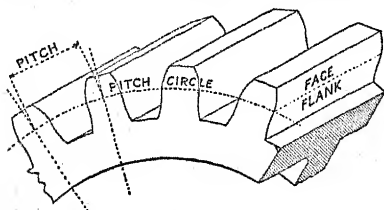
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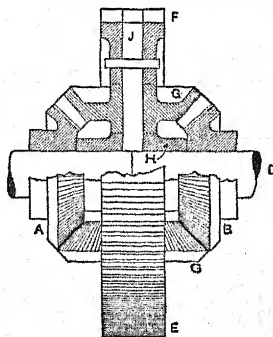
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therefore drive the bevel wheels A and B, and these rotate the car wheels. But if A is fixed, the idle wheels rotate about the spindles J, and also with the frame F. In rotating they drive B. A relative motion between A and B is thus made possible. Differential gearing is also used with governors, and in valve gears.—BIBLIOGRAPHY: D. A. Low, *Applied Mechanics; Modern Mechanical Engineering* (The Gresham Publishing Company).

**Geber** (eighth century A.D.), Arabian chemist or alchemist. His writings describe the purification, composition, and properties of the metals then known—gold, silver, copper, lead, tin, and iron—and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works on metaphysics, language, and astronomy, as well as on chemistry.

**Gebweiler**, a town of France, in Alsace, on the Lauch. It has works for cotton-spinning and weaving, woollen manufactures, bleaching, dyeing, calico-printing, and machinery. Pop. 13,380.

**Gecko**, a name common to the members of a cosmopolitan family of nocturnal lizards (Geckotidae), characterized by the general flatness of their form. Their feet are so constructed that they can run up a perpendicular wall.

**Ged**, William (1690–1749), inventor of stereotyping. He first practised his great improvement in the art of printing in 1725. He published a stereotype edition of Sallust in 1744.

**Geddes**, Sir Auckland Campbell (1879– ), British politician. In 1916 he was appointed Director of Recruiting, and in Aug., 1917, became Minister of National Service. President of the Local Government Board in 1918, and Minister of Reconstruction in Jan., 1919, he was appointed President of the Board of Trade in May of the same year. In March, 1920, he was sent as British Ambassador to the United States, a position which he resigned in Dec., 1923.

**Geddes**, Sir Eric Campbell (1875– ), British politician. In 1915 he entered the Ministry of Munitions, and was sent to France as director of military railways. Controller of the Navy in 1917, he became First Lord of the Admiralty, and in 1919 first Minister of Transport, resigning in 1921. He was chairman of the Government Economy Committee, 1921–1922.

**Geddes**, Jenny, the name tradition gives to a street fruit-seller who, during the tumult in St. Giles Church, Edinburgh, on Sunday, 23rd July, 1637, when the dean attempted to introduce the Episcopalian service-book, threw her stool at his head, exclaiming, "Villain! dost thou say mass at my lug?" This tumult led to events which annihilated Episcopacy and restored Presbyterianism.

**Geelong**, an Australian seaport, Victoria, near the head of the west arm of Port Philip Bay. There are several jetties and piers giving accommodation to vessels up to 9000 tons. There are wool-mills, tanneries, and ropeworks, and a considerable trade is done in wool. Pop. 36,415.

**Geestmünde**, a seaport of North Prussia, in Hanover, at the mouth of the Weser, almost incorporated with Bremerhaven. The trade is considerable, and Geestmünde is one of the chief German fishing-ports. The industries include shipbuilding, iron-founding, and engineering. Pop. 25,060.

**Gefle**, a seaport, Sweden, near the mouth of a river of the same name in the Gulf of Bothnia. It stands on both sides of the river and on two islands formed by it, and has an excellent harbour accommodating vessels of 24 feet draught. It has manufactures of linen, leather, tobacco, and sailcloth; shipbuilding yards; and an extensive trade in deals, tar, pitch, and iron. Pop. 36,623.

**Gegenbaur**, Karl (1826–1903), German comparative anatomist. In 1859 (the same year in which Darwin published his *Origin of Species*) Gegenbaur published an important work on comparative anatomy on evolutionary lines, which was followed by other works of a like kind, besides *Erlebtes und Erstrebtes* (1901), an autobiographical sketch.

**Gehenna**, a form of the Hebrew *Gehinnom*, the valley of Hinnom, in which was Tophet, where the Israelites sometimes sacrificed their children to Moloch (2 Kings, xxiii, 10). On this account the place was afterwards regarded as a place of abomination, and became the receptacle for the refuse of the city.

**Geibel**, Emanuel (1815–1884), German poet. In 1843 he published a tragedy, *King Roderick*; in 1846 the epic *König Sigurds Brautfahrt*. He wrote also *Brunhild*, a tragedy; *The Loreley*, an opera;

and other plays; but his fame rests on his lyrics, which were immensely popular.

Geikie, Sir Archibald (1835–1924), British geologist. He was director-general of the United Kingdom survey and head of the Museum of Practical Geology, London, from 1882 to 1901. He was the author of *Text-book of Geology*, *Class-book of Geology*, *Field Geology*, and *The Scenery of Scotland in connection with its Physical Geology*.

Geikie, James (1839–1915), British geologist. He was the author of *The Great Ice Age*, *Prehistoric Europe*, *Outlines of Geology*, *Mountains: their Origin, Growth, and Decay*, and *The Antiquity of Man in Europe*.

Geislingen, a town, Württemberg, Germany, 17 miles N.N.W. of Ulm. Pop. 13,521.

Geissler Tubes, vacuum tubes first made by Geissler of Bonn. They are made of glass, and contain a highly rarefied gas at a pressure of less than  $\frac{1}{2}$  mm. of mercury. When an electrical discharge is passed through a tube from an induction coil, it is accompanied by beautiful luminous effects, the colours of which depend on the nature of the gas. The tubes are useful for the spectroscopic examination of the luminous gas. See *Ionization*.

Gelada, a singular Abyssinian baboon, remarkable for the heavy mane which hangs over the shoulders, and which only grows when the animal is adult.

Gelatine is a nitrogenous substance derived from the cartilage and skins of young animals. The purest form is prepared from the head and leg portions of calves. The raw material must be perfectly fresh, and all decomposition avoided during subsequent manufacture. It is first carefully cleaned from traces of blood and flesh by washing, and then treated with steam or boiling water. The solution of gelatine is decolorized by treatment with sulphurous acid. The drying process must be very carefully watched, as the moist gelatine readily undergoes decomposition. Very large quantities are used in photography for the coating of films and plates.

Chemically, gelatine is a substance closely related to, but not identical with, the proteins. It contains the elements carbon, hydrogen, nitrogen, oxygen, and sulphur. When pure, it forms a colourless, transparent, tasteless, odourless, and

flexible substance. Gelatine is insoluble in alcohol or ether, but caustic soda and potash dissolve it readily. It swells in cold and dissolves readily in hot water. Gelatine, heated too often or too long, loses its property of setting, which is the main source of its value. Both as a jelly and in solution, gelatine gives a slight Tyndall effect, reflecting a beam of light sideways; but the ultramicroscope does not show definite particles. Gelatine is rendered absolutely insoluble in water by treatment with formaldehyde. In this form it is used, when dyed, for making spangles for dresses and for other purposes. See *Isinglass*.

Gelée, Claude. See *Claude Lorraine*.

Gellert, Christian Furchtegott (1715–1769), German poet. His hymns, tales, fables, and essays enjoyed much popularity in their day.

Gellius, Aulus (c. A.D. 130–180), Roman author. His *Noctes Attice*, a sort of commonplace book, is now of great value, as many of the works from which he drew his materials are lost.

Gellivara, a mountain and town in Swedish Lappland, within the Arctic Circle, in a locality exceedingly rich in iron ore (annual output over 1,000,000 tons). The town is connected by railway with Lulea on the Gulf of Bothnia, and with the growing Norwegian port of Narvik on the Ofoten Fiord, where quays and other works have been constructed for the shipment of the ore. Pop. 12,000.

Gelsemium, a genus of plants belonging to the nat. ord. Loganiaceæ, the best known, *G. sempervirens* or Carolina jasmine, being an evergreen climbing shrub of the Southern States of America.

Gelsenkirchen, a town in Prussia, Westphalia, on the border of the Rhine Province, a few miles north-east of Essen. It owes its rapid rise to the development of the coal and iron industries, which it shares with neighbouring towns. Pop. (1925), c. 200,000.

Gemara. See *Talmud*.

Gems, or precious stones, are sometimes found crystallized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. The first and most valuable class of gems includes



diamonds, emeralds, rubies, sapphires, and a few others; the second class includes the amethyst, topaz, garnet, &c.; while agate, lapis-lazuli, cornelian, &c., though much used for ornament, can scarcely be called gems. The various precious stones are described under their proper heads. The fabrication of artificial gems has become an important industrial art. *Paste* or *strass* is the base of one class of imitations, and consists of a complex borosilicate of lead and potassium, and is distinguished from ordinary glass by the presence of 50 per cent of oxide of lead. When the strass is obtained very pure, it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colours. Another class, called semi-stones or doublets, is made by affixing thin slices of real gem to an under part of strass by means of an invisible cement. The French chemists Becquerel, Ebelman, Gaudin, Despretz, and others have done much to manufacture true gems by artificial processes. In 1858 MM. Deville and Caron communicated to the Academy of Sciences, Paris, a process for the production of a number of gems of the corundum class, as rubies, sapphires, &c. Very small diamonds have been made from hydrocarbons subjected to a very intense heat and enormous pressure. Stones on which the design is raised above the general surface are called *cameos*; those having the design sunk below the surface are called *intaglios*. Modern gem-engraving dates from the beginning of the fifteenth century, the chief seats of the art being Italy and Germany. Rome is now the head-quarters of the seal-engraving art.

**Gemsbok**, the *Oryx gazella*, a large powerful member of the antelope family, inhabiting the plains of South Africa. It is about the size of an ass, with short mane, long tail, and long sharp-pointed heavy horns, nearly straight from base to tip.

**Gendarmes**, the French armed police. They are all picked men, usually taken from the regular forces. There are *horse gendarmes* and *foot gendarmes*. They are formed into small units called *brigades*; and the union of a number of these forms a *departmental company*.

**General**. In the British service there are three grades of general officer, the word 'general' without prefix signifying the highest of these grades. Next below comes

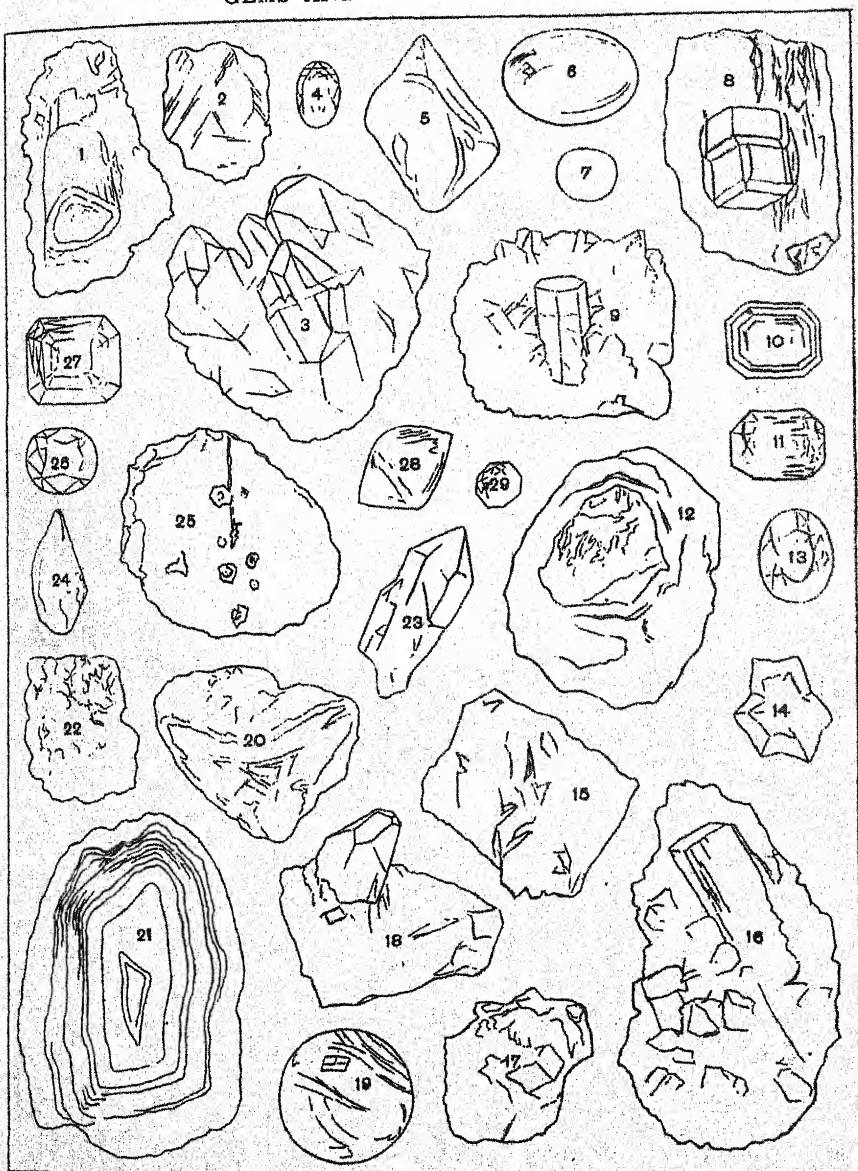
lieutenant-general, which again is followed by major-general. In conversation, and in all ordinary matters, the single word general is used for all three grades, while in formal official matters the full title is given. The title of brigadier-general formerly in use in the service has, since 1920, been abolished. This was merely a temporary rank given to officers holding certain appointments. Officers holding such appointments were known as colonels-commandant or colonels on the staff until 1928; now they are known as brigadiers. See illustration *Officers: (Marks of Rank)*.

**Generations, Alternation of.** (a) *In Plants*.—This phenomenon, rare among the lower forms (Thallophytes), becomes a constant and important feature in the higher groups (Cormophytes). It is seen in its most obvious form in the Ferns (q.v.), where the life-history comprises two distinct phases, the familiar fern-plant being the neutral or asexual generation or *sporophyte*, which ends with the production of asexual *spores*. When sown, these spores give rise *not* to a new fern-plant but to the prothallus or *gametophyte*, a small cellular structure which, as its name implies, produces *gametes*, viz. *spermatozoids* from antheridia and *egg-cells* in archegonia. Conversely, in Mosses and Liverworts the 'plant' is the gametophyte, and the sporophyte or *sporogonium* never becomes independent, but serves only for the production and dispersal of the spores.

(b) *In Animals*.—The phrase 'alternation of generations' is applied to the life-histories of animals when these consist of two or more distinct stages which reproduce in a different way, and might be mistaken for distinct species. Alternation of an asexual with a sexual form is known as *metagenesis*. Alternation of generations also includes what is known as *heterogeny*, where the life-history not only includes a sexual stage in which the eggs are fertilized, but also a series of females of which the eggs develop without being fertilized, i.e. by *parthenogenesis* (q.v.).

**Generator**. *Electric generators* may be divided into two classes: *Class 1*, generators of direct-current electricity, or *dynamos*; and *Class 2*, generators of alternating-current electricity, or *alternators*. Each of these classes is divided into *Group A*, high-speed machinery; *Group B*, medium- and low-speed machinery. Speeds from 75-400 r.p.m. may be

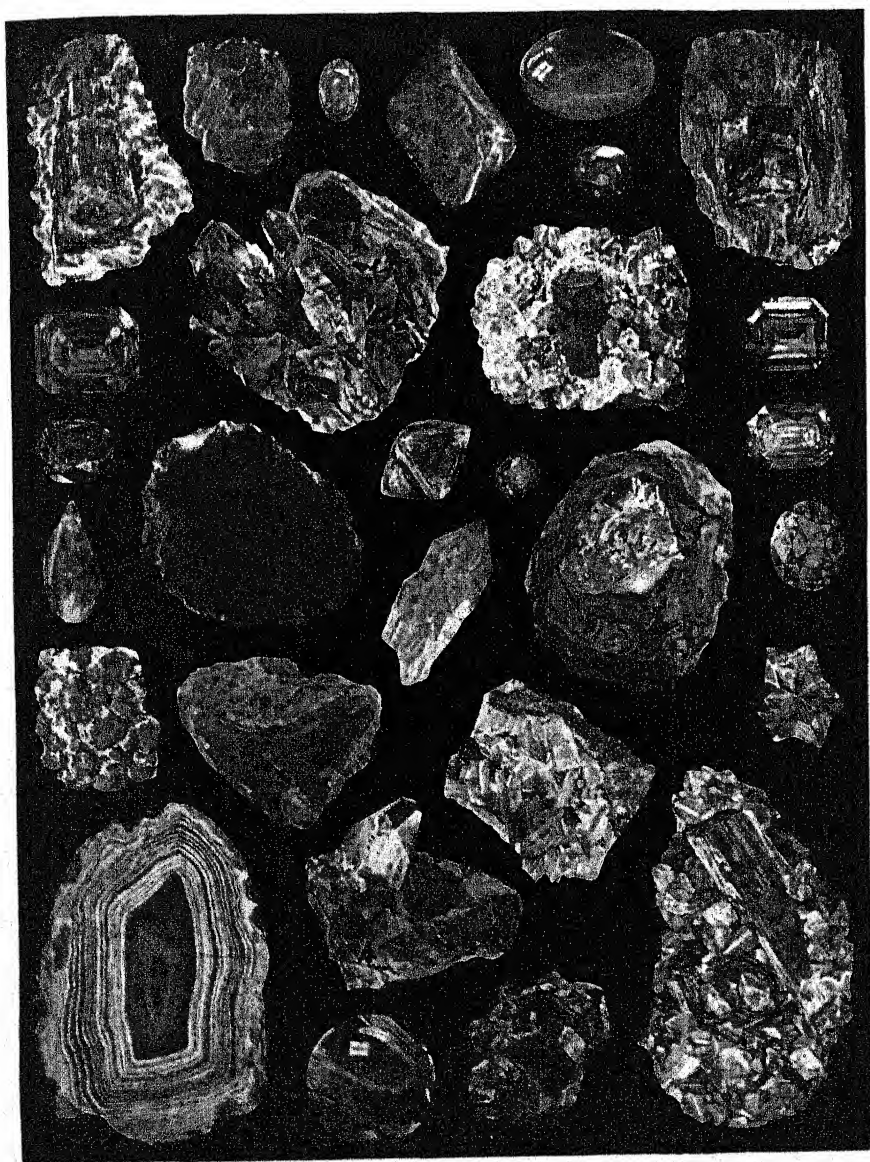
# GEMS AND PRECIOUS STONES



1. Tourmaline. 2 and 4. Ruby. 3. Amethyst. 5. Red Spinel (also cut stone 29). 6. Carbuncle.
- 7 and 8. Garnet. 9. Emerald. 10. Peridot. 11. Cairngorm. 12. Opal. 13. 14. Chrysoberyl. 15. Spinel
- (in felspar). 16. Beryl (in white Topaz). 17. Jargoon or Jacinth. 18. Blue Topaz. 19. Cat's Eye.
20. Sard. 21. Agate. 22. Turquoise. 23. Citrine. 24 and 26. Sapphire. 25. Bloodstone. 27. Topaz.
28. Yellow Diamond. 29. Red Spinel (also 5).



## GEMS AND PRECIOUS STONES



See key on covering tissue

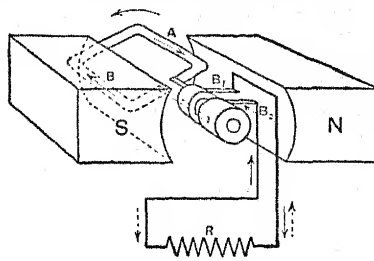




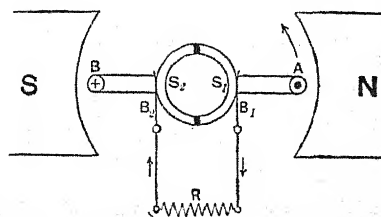
regarded as low speeds; from 400–1000 r.p.m., say, as medium speeds; and above 1000 r.p.m. as high speeds. The leading principles underlying the action of all dynamo-electric machinery are the same. Faraday discovered in 1831 that when the magnetic flux through a coil of wire changes, an electromotive force is set up in the coil. This E.M.F. is proportional to the rate of change of the flux. A powerful magnetic field is created by means of a large electromagnet, between the poles of which an 'armature' revolves. This armature consists of a core of soft iron carrying coils embedded in the periphery of it through which the magnetic field passes. The armature is caused to revolve and the coils revolve with it, hence the magnetic field—the 'flux' as it is called—which passes through them, changes. An electromotive force is therefore induced in the armature coils, and if these coils are closed by connecting the terminals of the machine to an outside circuit, an alternating current of electricity will flow (see *Electricity*). The temperature limit depends on the kind of insulation used, and rarely exceeds about 80° C. If, then, the normal atmospheric temperature is 20° C., we have a permissible rise of temperature of 60° C. The heating of the machine arises from two main causes: (1) the losses arising from the circulation of the current in the armature coils; and (2) the changes in the magnetic state of the iron of which the armature core is composed—the 'iron' or 'core' losses. The former depends upon the current density, the latter on the magnetic flux density; and these quantities must be limited to such values that the temperature of the machine does not exceed the prescribed limit. All medium turbo-alternators are ventilated by special fans, and the air used amounts to about  $\frac{1}{2}$  lb. per minute per kilowatt.

**Dynamos.**—The special problem of dynamo design, as distinct from alternator design, is the design of the 'commutator'. If the ends of the coil AB were brought out to a pair of *slip rings* (see the accompanying figure), the E.M.F. between  $B_1$  and  $B_2$  would be an alternating one, and this pressure would give rise to an alternating current in the external circuit  $r$ . In a dynamo we want a constant pressure, and so a device called a 'commutator' is introduced. In the figure a very simple commutator

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Simple Loop Dynamo



Simple Loop with Commutator

of the influence of pole N and begins to come into the influence of pole S, the spring B passes from one segment of the commutator to the other. The result is that the current in  $r$  is always in one direction; it is very fluctuating, as the pressure varies between nothing and the maximum value, but it is never reversed. By making the commutator in a great many segments, the pressure can be kept practically constant.

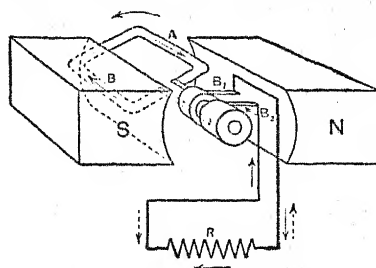
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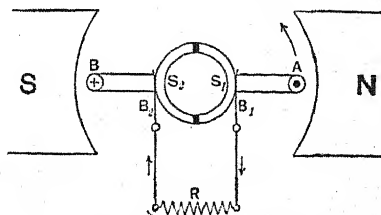
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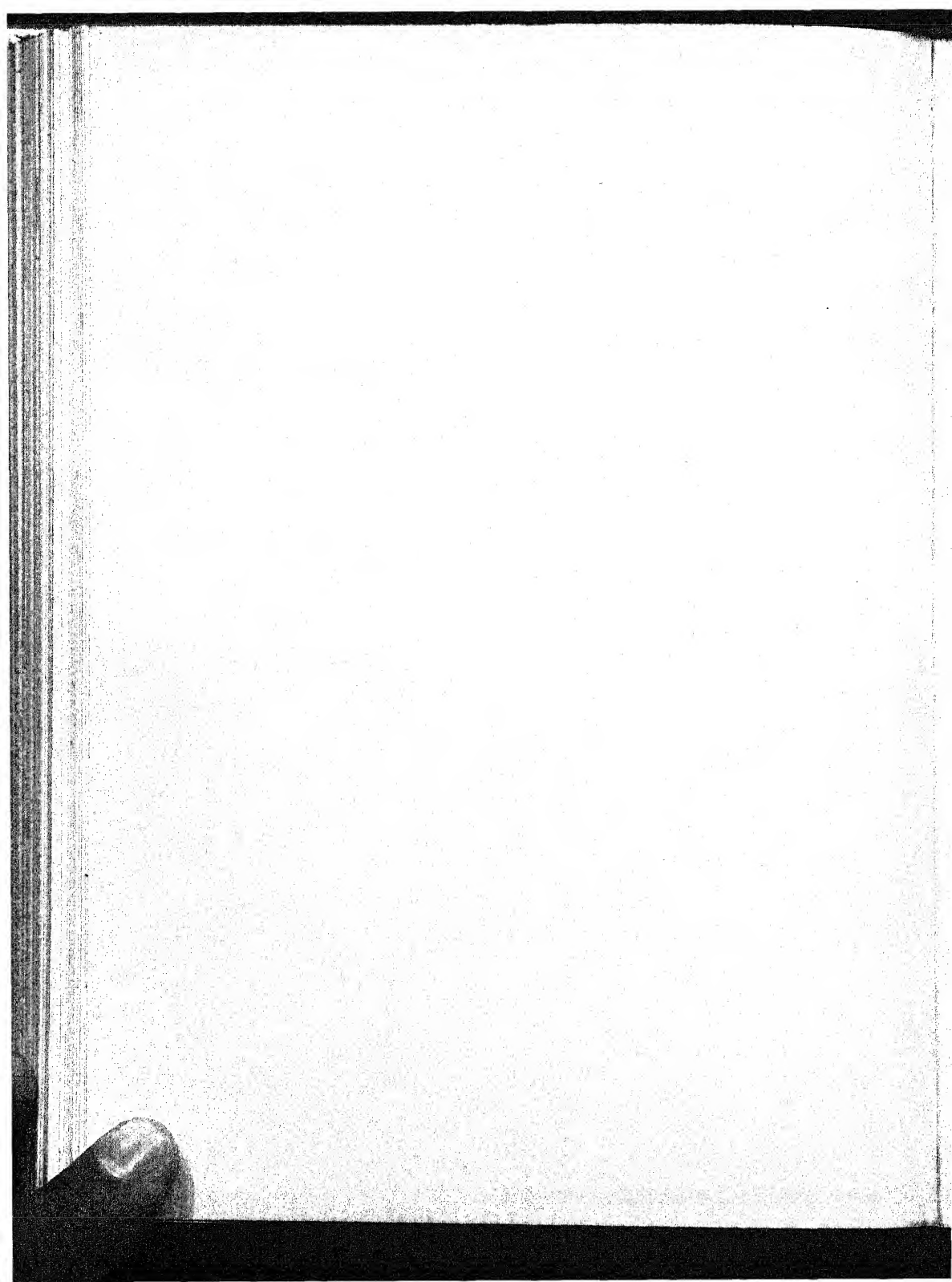


Simple Loop with Commutator

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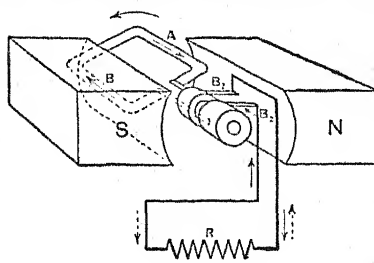




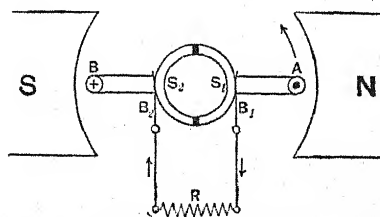
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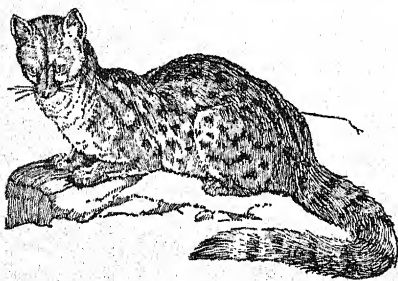
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all large alternators the field magnets revolve. A very common speed for a turbo-alternator is 3000 r.p.m. Low-speed machines are distinguished by a relatively large ratio of diameter to length, hence the parts are relatively much stiffer and have much higher fundamental frequencies, so that dangerous resonance is unlikely.—BIBLIOGRAPHY: *Modern Electrical Engineering* (The Gresham Publishing Company); Miles Walker, *Design and Specification of Dynamo-Electric Machinery*.

Genesee, a river of the U.S.A., which rises in Pennsylvania, and falls into Lake Ontario, 6 miles below Rochester, after a course of 145 miles. It has five remarkable falls.

Genesis, the first book of the Bible and of the Pentateuch. *Genesis* consists of two great but closely-connected divisions: (1) The history of the creation, the fall of man, the flood, the dispersion of the human race (chap. i-xi). (2) The history of the fathers of the Jewish race (chap. xii-l). A certain apparent difference of style and language, the occurrence of what seem gaps on the one hand, and repetitions and contradictions on the other, and the different use of the term for the divine name (*Jehovah*, Everlasting; and *Elohim*, Almighty) led very early to the question of the integrity of the book, and various critics have assumed larger or smaller interpolations.

Genet, a digitigrade carnivorous mammal of the family Viverridæ. The common



Genet (*Genetta vulgaris*)

genet (*G. vulgaris*), a small animal with the form of a small but elongated cat, sharp-pointed snout, long tail, and beautiful soft fur, is the best known of the genus *Genetta*. Its habits are like those of the weasel tribe.

Geneva, a town of Switzerland, capital of the canton of the same name, situated at the western extremity of the Lake of Geneva, on both sides of the Rhone. It was formerly surrounded by walls and fortifications, but since 1850 these have been removed. The more important public buildings are the cathedral of St. Pierre; the town house; the Musée Rath, containing a collection of pictures and other works of art; the university building; and the Museum of Natural History. The only important manufactures of Geneva are those of watches, musical-boxes, and jewellery. Geneva has ample railway communication, and is one of the principal entrances for tourists and travellers into Switzerland. Geneva early adopted the principles of the Reformation, and chiefly through the teaching of Calvin the town acquired an important influence over the spiritual life of Europe. In 1920 Geneva was selected as the official headquarters of the League of Nations. Pop. 135,059.

Geneva, Canton of, is bounded by the canton of Vaud and the Lake of Geneva, and by France. Area, 108 sq. miles. It belongs to the basin of the Rhone, and the only streams of importance are that river and the Arve. The soil has been so much improved by skilful and persevering culture that abundant crops of all kinds suitable to the climate are raised. Manufactures consist chiefly of clocks and watches, musical-boxes, mathematical instruments, gold, silver, and other metal wares, woollen cloths and silk goods of various descriptions, hats, leather, and articles in leather; and there are numerous cotton-mills, calico-printing works, and dyeworks. The territory of Geneva having, by the arrangements of the Congress of Vienna, obtained an accession of fifteen communes detached from France and Savoy, was admitted a member of the Swiss Confederation in 1814. Its Constitution of 1848 is the most democratic in the Federation. The language spoken is French. Pop. 171,000.

Geneva, Lake of, the largest of the Swiss lakes, extending in the form of a crescent, with its horns pointing southward, between France on the south and the cantons of Geneva, Vaud, and Valais: length, 55 miles; area, 224 sq. miles. The Rhone flows through it.

Geneva Bible, a copy of the Bible in English, printed at Geneva; first in 1560.

This copy was in common use in England till the version made by order of James I was introduced, and it was laid aside by the Calvinists with reluctance.

**Geneva Convention**, an agreement concluded at an international conference held in Geneva in 1864, for the succour of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers.

**Geneviève**, the name of two women well known in legend.—(1) St. Geneviève (c. 422–512), the patron saint of Paris. Her prayers and fastings are credited with having saved Paris from the threatened destruction by Attila in 451.—(2) Geneviève, by birth Duchess of Brabant, wife of Siegfried, Count Palatine in the reign of Charles Martel (about A.D. 750). According to the legend, she was accused of adultery during her husband's absence and condemned to death, but was allowed to escape. Her husband afterwards became convinced of her innocence, found her, and brought her home.

**Genghis Khan**, or **Jenghis Khan** (c. 1160–1227), Mongol conqueror. After much intestine warfare with various Tatar tribes, Genghis was proclaimed Khan of the United Mongol and Tatar tribes. He now professed to have a divine call to conquer the world. In 1209 he passed the great wall of China. The capital, then called *Yenking*, now *Peking*, was taken by storm in 1215 and plundered. He then undertook the invasion of Turkistan in 1218 with an army of 700,000 men; and the two cities of Bukhara and Samarkand were stormed, pillaged, and burned. Seven years in succession was the conqueror busy in the work of destruction, pillage, and subjugation, and he extended his ravages to the banks of the Dnieper. In 1225, though more than sixty years old, he marched in person at the head of his whole army against the King of Tangut (South-Western China). A great battle was fought, in which the King of Tangut was totally defeated with the loss of 300,000 men. After the death of Genghis his immense dominions were divided among his four sons.

**Genii**, tutelary deities; the ruling and protecting powers of men, places, or things;

good or evil spirits supposed to be attached to a person and to influence his actions. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius, that is, a spiritual being, which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career.

**Genista**, a genus of leguminous plants, comprising about 100 species, one of which is the *Planta genista*, the *Plante genêt*, from which the Plantagenets took their name, and another *Genista tinctoria*, or dyer's broom.

**Genlis**, Stéphanie Félicité Ducrest de St. Aubin, Comtesse de (1746–1830), French authoress. In 1782 the Duc de Chartres (Philippe Égalité) appointed her governess of his children. She introduced new methods of teaching. Her works, which embrace a wide variety of subjects, amount altogether to about ninety volumes, and include some of the standard novels in the French language. Her voluminous *Mémoires*, written when she was upwards of eighty years of age, abound in scandal, and are full of malignant attacks upon her contemporaries.

**Genoa**, a seaport of North Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean, at the head of the gulf of the same name. It is enclosed by extensive fortifications. The principal palaces are the Ducal palace (the old residence of the Doges); the Palazzo del Municipio or town hall; the Palazzo Brignole or Rosso, containing a fine picture-gallery; Palazzo Bianco; the Palazzo Marcello-Durazzo or Durazzo-Pallavicini; the Palazzo Reale (Royal Palace); and the palaces of Doria, Spinola, Cambiaso, and Balbi-Senarega. The most remarkable of the churches is the Duomo, or cathedral of St. Lorenzo, founded in the eleventh century. Besides the university, refounded in the eighteenth century (1100 students), the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, the navigation school, various secondary schools, &c. The Campo Santo, or cemetery, about 2½ miles from the city, is one of the most beautiful burial-grounds in Europe. The manufactures of Genoa include cotton and silk goods, gold, silver, paper, and leather goods, sugar, and preserved fruits; there are also engineering,



shipbuilding, and other industries. Its connexions by rail with the St. Gothard Tunnel make Genoa one of the chief Mediterranean ports. The largest vessels can enter the harbour, which has an area of 519 acres and a quay length (jetties, piers, and wharves) of 40,471 feet. The depth alongside varies from 40 to 70 feet. There are several dry-docks, the largest being 720 feet long. Genoa is an important outlet for goods sent by sea from North Italy and Switzerland, and is of still greater importance as a port of entry. The principal articles of export at present are silk, oils, wine, fruit, cheese, rags, marble, hemp, and the products of its manufactures. Great quantities of British coal are imported.

Under the Romans, Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by Doges. From 1119–1284 it was almost constantly at war with Pisa. The rivalry between Genoa and Venice was a fruitful source of wars during the twelfth, thirteenth, and fourteenth centuries. Meanwhile the city was convulsed by civil discord and party spirit. From the contests of noble rivals, in which the names of Doria, Spinola, Grimaldi, and Fieschi are prominent, Genoa was drawn into the Guelph and Ghibelline contest. In 1528 the disturbed state regained tranquillity and order, which lasted till the end of the eighteenth century. The form of government established was a strict aristocracy. After the battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the Empire of France, and in 1815 the Congress of Vienna awarded the town to the Kingdom of Sardinia. Pop. (1929), 623,196.—The province of Genoa has an area of 682 sq. miles, and a pop. of (1928) 921,785.—Cf. Bent, *Genoa: how the Republic Rose and Fell*.

**Genoa, Gulf of**, a large indentation of the Mediterranean, in North Italy, at the head of which lies the city and port of Genoa.

**Genserik, or Gaiseric** (c. 390–477), king of the Vandals. Having obtained joint possession of the throne of Spain with his brother Gonderic, he crossed the Straits of Gibraltar with 50,000 men, A.D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. He, however, soon

declared his independence and founded a kingdom, which in 439 had its seat at Carthage. He collected a powerful fleet, ravaged the coasts of Sicily and Italy, and in 455 took and sacked Rome.

**Gentian**, the name given to the members of the genus *Gentiana* (order *Gentianaceæ*), a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue, yellow, or red, often showy flowers. They are usually found on the hilly districts of the northern hemisphere, the most important species being the *Gentiana lutea* of Germany and Switzerland. *Enziangeist* or 'gentian-spirit' is made from it. Five species are British.

**Gentianaceæ**, the gentians, an order of gamopetalous Dicotyledons, consisting mostly of annual or perennial herbaceous plants, with opposite often connate entire leaves, and yellow, red, blue, or white flowers. All are characterized by their bitter principle. The order contains about 800 species.

**Gentile**, in Scripture, anyone belonging to the non-Jewish nations and not a Christian; a heathen. The Hebrews included in the term *goyim*, or nations, all tribes of men who had not received the true faith and were not circumcised.

**Geodesy**. The science of geodesy deals with the shape and dimensions of the earth, its density, and its attraction. Geodesy is largely a mathematical outcome of survey operations. That the shape of the earth was spherical was known in Egypt and Greece in the third century B.C. It was not until the seventeenth century A.D., however, that substantial progress was made in accurate measurement. Perhaps the most memorable achievement in this progress was the conception of a measurement by triangulation due to Willebrord Snell in 1617. If we assume the form of the earth to be spherical, we can calculate its dimensions in a variety of ways and arrive at a fair approximation. There is, however, only one exact method of arriving at both its form (which is not truly spherical) and its dimensions, and that is by actually measuring arcs on the earth (preferably along meridians), and by determining by astronomical observation the latitude of the ends of these arcs. Early in the eighteenth century a start was made in France in arc measurement. Towards the close of that century several national

geodetic triangulations were developing, and to-day in Europe, Asia, North America, and Africa we have, through the continual extension of these triangulations, enough actual measurement to guarantee a very close approximation to the truth. In modern geodetic triangulations the sum of the three observed angles of a triangle will be within 1 second of the truth. The two most important determinations of the figure of the earth are as follows:—

Name.	Date.	Semi-axis Major in Metres.	$\frac{1}{\text{Compression}}$
Helmert ..	1906	6,378,200	298.3
Hayford ..	1911	6,378,383	296.96

If the earth were a homogeneous sphere at rest, the force of gravity would be the same for all surface points. As it is, however, the earth's rotation and its spheroidal form cause an alteration in the force of gravity, the magnitude of which depends upon the latitude and the height above mean sea-level. This alteration in the force of gravity can be measured by counting the vibrations of a pendulum. Pendulum or gravity surveys give us, then, a second exact method of computing the form (though not the dimensions) of the earth.

**Geoffrey of Monmouth** (d. 1154), British ecclesiastic and historian. He sprang from the Norman settlers in Wales; became Archdeacon of Monmouth, whence he was, in 1152, raised to the bishopric of St. Asaph. His so-called *History of the Britons* (*Historia Britonum*), in circulation by 1139, is now known to consist mainly of fiction. It was soon translated into French, English, and Welsh, and became a great source of romance to the writers of successive generations.

**Geoffroy St. Hilaire, Étienne** (1772–1844), French naturalist. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera. This view met with strong opposition from Cuvier. Among his principal works are: *Sur le principe de l'unité de composition organique*,

*Philosophie anatomique*, and *Notions de philosophie naturelle* (1838).

**Geoffroy St. Hilaire, Isidore** (1805–1861), French physiologist and naturalist, son of the preceding. One of his chief works, *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux*, added valuable confirmation to the theories of his father. He founded the Acclimatization Society of Paris.

**Geography.** Geography is the description of the earth in its relation to man. It is based on knowledge of the surface of the earth as discovered by exploration, and interpreted by various sciences, such as meteorology for the weather, zoology and botany for animal- and plant-life, anthropology for the human race, and geology for the structure of the earth and the development of its surface features. Geography is dependent on astronomical methods for the determination of positions and the mathematical basis of maps, and is closely associated with history in the study of social conditions. Geography uses the results of each of these departments of knowledge for the advance of its own special subject—the relation of man to his environment.

*The Surface of the Earth.*—The surface of the earth consists of a rocky crust, of which the raised portions form the lands, while the intervening depressions are occupied by the seas. The major elevations are the continents; the major depressions are the ocean basins. Minor geographical features, including both hollows and ridges, have been largely excavated by various geographical agents. Rivers and glaciers wear out or enlarge valleys; the wind and the sea abrade the surface of the land into plains; the formation of beds of clay and sand over the floors of valleys, of lakes, or of the sea produces plains of deposition. Many hills and mountains are residual masses left between valleys excavated by erosion; others are piles of material discharged by volcanic eruptions. Some valleys, basins, and mountains are, however, due directly to earth movements, in areas that have been lowered or raised by fold or fracture.

The variations in level of the earth's surface give rise to geographical structures known as the land-forms, of which there are two main categories. The

positive land-forms are the solid features in the face of the earth, including plains, plateaus, and mountains; the negative land-forms are the spaces between the positive land-forms, and are classified into valleys and basins.

i. *The Positive Land-forms.*—(a) *Plains* are widespread areas with an even surface and situated at a low level in relation to the surrounding country. There are four chief varieties of plains: coastal-plains, those due to the uplift of the sea-floor; river-plains, those formed by the deposition of material by rivers along their course; plains of marine denudation, those due to the cutting back of the coast by the sea; and peneplains, those due to the levelling of a country by rivers and wind.

(b) *Plateaus* are flat-topped areas which are well raised above the surrounding country. The surface of a plateau in countries with a moderate rainfall is gradually destroyed, for, as streams cut into it, the plateau is dissected into an irregular or old plateau; later, when the valleys have been deepened and widened, the plateau is converted into a tract of highlands, in which the essential structure is indicated only by the fact that the majority of the residual ridges and peaks reach the original surface and none rise above it.

(c) *Mountains and hills* are raised areas which culminate in well-marked summits or crests. Some of them are due to parts of the earth's crust having been crumpled into folded bands by lateral pressure, as a cloth is wrinkled into folds when pushed across a table. Fold-mountains occur as long, relatively narrow ridges, of which the unit is the mountain range. A series of ranges due to a common origin forms a mountain chain, such as the Alps or Pyrenees. A connected series of chains formed about the same date and by a common cause forms a mountain system. Block-mountains are blocks or slabs of the earth's crust which have been uplifted, or which have been left upraised by the subsidence of adjacent areas. A mountain mass thus formed is known as a horst. Volcanic mountains are accumulations of lava or tuff discharged by volcanic eruptions. Residual mountains are those left upstanding owing to the removal of the adjacent land by denudation.

ii. *Negative Land-forms.*—They include

two classes—basins which are wide, and valleys which are narrow, in comparison to their length. The greatest of the basins are those occupied by the oceans. Some smaller but still extensive basins are occupied by the enclosed seas. Basins of which the floor consists of land are chief centres of population.

Valleys vary from great oceanic troughs, like that of the Atlantic, to wide old river valleys, and to the narrow young valleys known as gorges and canyons. The majority of the minor valleys and basins have been made by excavation. Basins are often due to a valley formed by excavation having been divided by the raising of a barrier across it by a 'warping' or rumpling of the surface. Some valleys and basins are due to the direct subsidence of their floors forming sunk-lands in the case of basins, and rift-valleys in the case of valleys. Small basins due to the subsidence of their floors are known as cauldrons.

The floor of the sea is diversified by variations in level, similar in kind to those on the surface of land. The negative forms on the sea-floor are the 'depression', which includes basins, troughs, trenches (i.e. small troughs), and 'deeps' (i.e. the deepest part of a depression). The positive forms are the 'shelf', a submerged coastal plain which slopes gradually from the level of low tide to the depth of from 300 to 600 feet; the 'rise', a large, gently-rising mound; the 'ridge', which is long and narrow; the 'plateau', which is about as long as it is broad; and the 'height', a peak-like summit.

Coasts may be long and straight where the action of the tide has filled up the bays and cut back the headlands. Coasts are deeply indented where the land has sunk, so that the sea has flooded the former valleys. A drowned coast is characterized by having many irregular arms of the sea which run far inland, by projecting in long peninsulas and headlands with curved shores, and by a fringe or festoon of islands. Arms of the sea on drowned coasts are known as 'rias'. On a drowned fractured coast the sea extends inland in long, narrow, canal-like channels between high straight walls, with angular bends and branches; such arms of the sea are known as 'fjords'.

*Lands and Continents.*—See *Africa; America; Asia; Australia; Europe; Oceania;*

*Polar Regions;* and articles on various countries, districts, and states. See also the various orographical maps.

*The Oceans.*—The sea occupies five-sevenths of the earth's surface, and its chief divisions are the five oceans. The Atlantic forms the long sinuous trough between the Americas and the Old World. The Pacific, the largest geographical unit on earth, separates America from Asia and Australia, and ends southward against Antarctica. The Arctic Ocean around the North Pole occupies a deep basin connected by shallow broad outlets to the Atlantic, and by the narrow Behring Strait to the Pacific. The Indian Ocean is comparatively small, and forms the basin between Southern Asia, Africa, and Australia. The Antarctic Ocean extends from South America and Graham Land eastward to New Zealand, and includes the long belt of sea to the south of the Atlantic and Indian Oceans and of Australia. See separate articles.

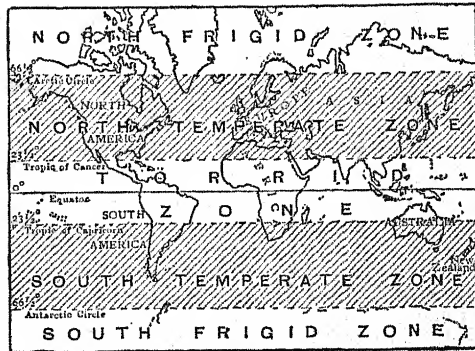
*Weather and Climate.*—The economic value of a land depends, as a rule, mainly upon its climate, which is the average of its weather. Climate depends mainly on the distribution of heat and moisture. The heat is received from the sun, and the moisture from the sea. The heat from the sun is very unevenly distributed upon the earth, as areas which are almost at right angles to the sun's rays receive more heat than those where the rays fall very obliquely upon the surface, so that the heat is more widespread, and more is absorbed by the atmosphere owing to the longer passage through it.

The irregularity in the distribution of heat is reduced by the earth's axis of rotation being inclined to the plane of its orbit. The sun accordingly passes sometimes north and sometimes south of the equator; the polar regions receive more heat than would reach them if the equator and ecliptic were coincident.

The earth is divided into five zones, distinguished by their position in respect to the sun. The Torrid Zone lies between the two tropics, and includes the belt over which the sun is sometimes directly overhead. The two Temperate Zones, between the parallels of about  $23\frac{1}{2}^{\circ}$  and

$66\frac{1}{2}^{\circ}$ , are those in which the sun is never directly overhead, but rises above the horizon every day in the year. In the two Frigid Zones, which include the areas north of  $66\frac{1}{2}^{\circ}$  N. and south of  $66\frac{1}{2}^{\circ}$  S., the sun during some days of the year does not appear above the horizon; the long winter night thus caused reaches its maximum of six months at the poles.

The moisture that falls as rain and supplies the lands with fresh water is raised from the sea by evaporation, which is greatest within the tropics. The moisture is driven along by the winds until it is precipitated by an adequate fall in temperature. When the air is cooled to a



Map of the World showing the Zones

degree at which it is 'super-saturated' with moisture, the excess is precipitated as dew, rain, snow, or hail. The two main causes of precipitation are the uplift of air into a higher, colder level of the atmosphere, and the fall of temperature at night, which causes the deposit of dew. As the air is blown against rising land, it is forced upward and thus chilled, and part of its moisture is precipitated. Hence rainfall is, as a rule, greatest where air that has been carried inland from the oceans is uplifted against the mountains.

The circulation of air by the wind is the chief factor in the distribution of moisture and of rain. The main movements of the air are: (1) a general drift eastward, owing to its lagging behind the ground beneath it during the rotation of the earth. (2) The Trade Winds (so-called from the use of the word 'trade' for a path or passage)



are due to the air being drawn northward and southward in order to replace that which rises above heated tropical areas. These winds are deflected from their course due northward or southward owing to the rotation of the earth. In the northern hemisphere they blow from north-east to south-west, and in the southern hemisphere from south-east to north-west. (3) The Anti-Trades. The air carried towards the equator by the Trade Winds is returned by a high-level current in the opposite direction. This air, becoming chilled, falls to the surface of the earth outside the Trade Wind belt, and there gives rise to strong, steady winds that blow in the opposite direction to the Trade Winds. They are known as the Anti-Trades. As the sea extends uninterruptedly around the world in the zone of the southern Anti-Trades, the winds are of special power in the belt south of  $40^{\circ}$ , which is known as the 'Roaring Forties'. (4) The Monsoons are a series of regular winds around the Indian Ocean which change their direction twice a year. They are due to the main ascending air-current shifting its position with the sun; it does not always rise above the equator, but above the 'thermal equator', the line over which the sun passes in the daily rotation of the earth. This line moves northward and southward. During the northern summer it lies across Southern Asia, and causes a great ascending air-current over South-Central Asia. This air is replaced by a current from the Indian Ocean; so from April to October the monsoon blows from south-west to north-east. During the northern winter the sun travels across the earth south of the equator; the highlands of Central Asia are then cold, and a descending air-current upon them produces winds which blow outward to the Indian Ocean. Hence from October to April the monsoon blows from north-east to south-west.

In the Temperate Zones the air movements are irregular. They are due to circular wind systems around areas of low pressure known as cyclones, and around areas of high pressure known as anti-cyclones. As in cyclones the air is ascending, they are accompanied by rain. As the air in anti-cyclones is falling, the conditions under them are dry. The cyclones and anti-cyclones travel from west to east; but as the winds around them are circular, the regions crossed by them are subject

to winds which are inconstant alike in strength and direction. See *Cyclone*.

The air circulation, therefore, controls the rainfall, and mere proximity to the sea does not ensure a good supply of rain. Where the sea-water along a coast is cold, the air that blows ashore has its temperature raised and its capacity for carrying moisture increased by the greater heat of the land; hence this air does not drop its moisture as rain until it has been sufficiently uplifted to be cooled below its temperature on the sea. Parts of the coast of Chile and Peru, of South-Western Africa, and of Somaliland, owing to these conditions, have arid climates.

The agricultural value of rain depends upon its distribution through the year and the period of its fall. In the monsoons, as the ascending air-currents over the land occur during the summer-time, the monsoonal regions have summer rains and dry winters. In the Trade Wind belt, as the western coastlands have off-shore winds, they are usually dry; and as on the eastern side of the continents the Trade Winds blow in from the sea, the rainfall on them is heavy and mostly falls in the winter months. The Mediterranean type of climate is that in which the rainfall is mainly in the winter and the summers are dry; it occurs on the outer side of the Trade Wind belts, especially along the Mediterranean, and along some of the western coasts of America, South-Western Africa, and Southern Australia.

The winds have a powerful effect upon climate by controlling the distribution of sea-water, and by drawing up to the surface some of the almost ice-cold deep-sea water, which has a chilling effect on the weather.

The ocean controls the environment of man on earth. From its surface is raised the water which maintains the rainfall and renews the rivers. It modifies the temperature of the winds which blow across them; it prevents injurious variations in the composition of the atmosphere by absorbing any excess of carbonic dioxide after volcanic eruptions, and by giving forth fresh supplies to replace the amount removed by absorption during the growth of vegetation or by the weathering of rocks.

The surface-waters of the ocean are pushed forward by the winds, thus giving rise to broad, slow movements known as

drifts, and to narrow, swifter, and more constant streams known as ocean-currents. The equatorial parts of the oceans are mostly subject to a westward drift under the influence of the Trade Winds. In the mid-temperate zones the drift is mainly eastward under the pressure of the prevalent westerly winds. When the drift is obstructed by coming against a continent, the water is piled up, and the excess overflows as an ocean-current. In the Atlantic the equatorial drift from east to west drives water into the Gulf of Mexico; thence it escapes as the Gulf Stream, which can be traced by the warmth and saltiness of its water to Newfoundland. It is there dissipated, and the surface temperatures are lowered by the Labrador current, which flows southward from the Greenland seas. In most of the North Atlantic there is a widespread drift, proved, for example, by parts of ships which have been wrecked in America being washed ashore on the coast of Europe. The water carried eastward by this drift is forced against the coast of Southern Europe, and is piled up there in a raised area, whence a regular outflow, the European Current, discharges northward past the British Isles and helps to warm the seas of North-Western Europe. The Canaries Current from the same area discharges southward along the West African coast. In the South Atlantic some of the water that has drifted eastward across the Southern Ocean is driven against the western coast of South Africa, and thence flows north as the Benguella Current. The water of the western equatorial drift across the Atlantic impinges against the coast of Brazil, and then flows southward along the American coast as the Brazil Current.

The circulation in the Pacific is essentially similar to that in the Atlantic. A broad westward drift across the equatorial zone piles up water against the coast of China, whence a current known as the Kuro Sivo flows northward past Japan; it corresponds to the Gulf Stream. A current from Kamchatka flows southward to Japan, and corresponds to the Labrador Current that discharges into the North Atlantic from Greenland. An eastward drift across the North Pacific banks water against the western coast of the United States; the overflow southward is the Californian Current, which corresponds to the Canaries Current in the Atlantic.

In the South Pacific the eastward drift of the cold sub-Antarctic water is deflected northward by the obstruction of South America, and flows along the coasts of Chile as the Peruvian Current; this stream is dissipated near the equator, and its waters are returned westward across the tropical Pacific in the southern equatorial drift.

In the Southern Ocean a predominant easterly drift is maintained by the west winds. This drift feeds the Benguella and West Australian Currents.

*Distribution of Plants.*—The distribution of plants is controlled by two series of factors—climatic and edaphic. The edaphic are those dependent on the soil, its textures, its properties as regards water, its supply of plant foods, and the presence or absence of poisonous constituents, some of which are fatal to special plants, and others to all plants. The climatic effects are due mainly to variations in heat, moisture, and light. Heat has the broadest general effect on the distribution of plants, so that the character of the vegetation varies primarily with distance from the tropics. The secondary variations depend on distance from the coast, which affects the supply of moisture, and on height above sea-level, which largely controls the local temperature. For areas with similar positions and soils, distance from the equator is the dominant factor. The primary botanical divisions are therefore into seven parallel zones, the Tropical, North and South Subtropical, North and South Temperate, and the Frigid Zones, Arctic and Antarctic.

In the tropics, lowlands and mountain slopes which receive heavy rain are usually covered by dense forests with luxuriant foliage. These forests may have a jungly undergrowth, or the ground may be open and the foliage form a high canopy, supported by a web of lianas or other twining plants which connect the crowns of the trees.

Muddy tropical coasts are often fringed with forests of mangroves. Sandy tropical shores and low islands, the soils of which are often saturated with salt water, support groves of coco-nut palms. The palms are characteristic of the tropics, and they grow isolated or in clusters, or as open forests, on the plains. At some distance from the sea and in the drier areas forests give place to park-like grassy plains with scattered trees. In areas with a still more

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are due to the air being drawn northward and southward in order to replace that which rises above heated tropical areas. These winds are deflected from their course due northward or southward owing to the rotation of the earth. In the northern hemisphere they blow from north-east to south-west, and in the southern hemisphere from south-east to north-west. (3) The Anti-Trades. The air carried towards the equator by the Trade Winds is returned by a high-level current in the opposite direction. This air, becoming chilled, falls to the surface of the earth outside the Trade Wind belt, and there gives rise to strong, steady winds that blow in the opposite direction to the Trade Winds. They are known as the Anti-Trades. As the sea extends uninterruptedly around the world in the zone of the southern Anti-Trades, the winds are of special power in the belt south of  $40^{\circ}$ , which is known as the 'Roaring Forties'. (4) The Monsoons are a series of regular winds around the Indian Ocean which change their direction twice a year. They are due to the main ascending air-current shifting its position with the sun; it does not always rise above the equator, but above the 'thermal equator', the line over which the sun passes in the daily rotation of the earth. This line moves northward and southward. During the northern summer it lies across Southern Asia, and causes a great ascending air-current over South-Central Asia. This air is replaced by a current from the Indian Ocean; so from April to October the monsoon blows from south-west to north-east. During the northern winter the sun travels across the earth south of the equator; the highlands of Central Asia are then cold, and a descending air-current upon them produces winds which blow outward to the Indian Ocean. Hence from October to April the monsoon blows from north-east to south-west.

In the Temperate Zones the air movements are irregular. They are due to circular wind systems around areas of low pressure known as cyclones, and around areas of high pressure known as anti-cyclones. As in cyclones the air is ascending, they are accompanied by rain. As the air in anti-cyclones is falling, the conditions under them are dry. The cyclones and anti-cyclones travel from west to east; but as the winds around them are circular, the regions crossed by them are subject

to winds which are inconstant alike in strength and direction. See *Cyclone*.

The air circulation, therefore, controls the rainfall, and mere proximity to the sea does not ensure a good supply of rain. Where the sea-water along a coast is cold, the air that blows ashore has its temperature raised and its capacity for carrying moisture increased by the greater heat of the land; hence this air does not drop its moisture as rain until it has been sufficiently uplifted to be cooled below its temperature on the sea. Parts of the coast of Chile and Peru, of South-Western Africa, and of Somaliland, owing to these conditions, have arid climates.

The agricultural value of rain depends upon its distribution through the year and the period of its fall. In the monsoons, as the ascending air-currents over the land occur during the summer-time, the monsoonal regions have summer rains and dry winters. In the Trade Wind belt, as the western coastlands have off-shore winds, they are usually dry; and as on the eastern side of the continents the Trade Winds blow in from the sea, the rainfall on them is heavy and mostly falls in the winter months. The Mediterranean type of climate is that in which the rainfall is mainly in the winter and the summers are dry; it occurs on the outer side of the Trade Wind belts, especially along the Mediterranean, and along some of the western coasts of America, South-Western Africa, and Southern Australia.

The winds have a powerful effect upon climate by controlling the distribution of sea-water, and by drawing up to the surface some of the almost ice-cold deep-sea water, which has a chilling effect on the weather.

The ocean controls the environment of man on earth. From its surface is raised the water which maintains the rainfall and renews the rivers. It modifies the temperature of the winds which blow across them; it prevents injurious variations in the composition of the atmosphere by absorbing any excess of carbonic dioxide after volcanic eruptions, and by giving forth fresh supplies to replace the amount removed by absorption during the growth of vegetation or by the weathering of rocks.

The surface-waters of the ocean are pushed forward by the winds, thus giving rise to broad, slow movements known as

drifts, and to narrow, swifter, and more constant streams known as ocean-currents. The equatorial parts of the oceans are mostly subject to a westward drift under the influence of the Trade Winds. In the mid-temperate zones the drift is mainly eastward under the pressure of the prevalent westerly winds. When the drift is obstructed by coming against a continent, the water is piled up, and the excess overflows as an ocean-current. In the Atlantic the equatorial drift from east to west drives water into the Gulf of Mexico; thence it escapes as the Gulf Stream, which can be traced by the warmth and saltiness of its water to Newfoundland. It is there dissipated, and the surface temperatures are lowered by the Labrador current, which flows southward from the Greenland seas. In most of the North Atlantic there is a widespread drift, proved, for example, by parts of ships which have been wrecked in America being washed ashore on the coast of Europe. The water carried eastward by this drift is forced against the coast of Southern Europe, and is piled up there in a raised area, whence a regular outflow, the European Current, discharges northward past the British Isles and helps to warm the seas of North-Western Europe. The Canaries Current from the same area discharges southward along the West African coast. In the South Atlantic some of the water that has drifted eastward across the Southern Ocean is driven against the western coast of South Africa, and thence flows north as the Benguella Current. The water of the western equatorial drift across the Atlantic impinges against the coast of Brazil, and then flows southward along the American coast as the Brazil Current.

The circulation in the Pacific is essentially similar to that in the Atlantic. A broad westward drift across the equatorial zone piles up water against the coast of China, whence a current known as the Kuro Sivo flows northward past Japan; it corresponds to the Gulf Stream. A current from Kamchatka flows southward to Japan, and corresponds to the Labrador Current that discharges into the North Atlantic from Greenland. An eastward drift across the North Pacific banks water against the western coast of the United States; the overflow southward is the Californian Current, which corresponds to the Canaries Current in the Atlantic.

In the South Pacific the eastward drift of the cold sub-Antarctic water is deflected northward by the obstruction of South America, and flows along the coasts of Chile as the Peruvian Current; this stream is dissipated near the equator, and its waters are returned westward across the tropical Pacific in the southern equatorial drift.

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arid climate the conditions become those of the desert. The continuous turf breaks up into scattered tufts of dry grass; the herbs grow in cushion-like masses; shrubs have thick and fleshy leaves and stems, like the aloe and cactus; the trees have needle-shaped instead of broad flat leaves, and their trunks may be succulent like the giant euphorbias, or may be huge masses of soft wood like the baobab. These modifications are adapted to reduce loss of water by evaporation. The trees, moreover, in arid regions often have a growth of thorns to protect them from animals ravenous during drought; and they are often umbrella-shaped in order to lessen their resistance to the wind.

The Subtropical Zones have forests of hard-leaved evergreen trees, such as the cork-oak; they grow in areas with a Mediterranean rainfall, as along the Mediterranean, in California, South-Western Africa, and South-Western Australia. The structure of their leaves reduces loss of moisture during the long dry summer. In other parts of the Subtropical Zone are forests of conifers, such as the Italian and the Aleppo pines.

In the colder parts of the North Temperate Zone the characteristic trees, e.g. the oak, beech, elm, ash, and birch, are deciduous; they shed their leaves in the autumn, whereby their foliage is not subject to frost, and the trees offer less resistance to winter gales. The hills are often covered by vast forests of spine-leaved trees, e.g. pines and firs. The plains and downs are clad in turf, and form the world's most extensive grazing-lands. The arable ground, owing to the moderate cold in winter and heat in summer, is especially favourable for cereals, although, unlike the tropics, as a rule only one crop can be reaped in the year.

In the Frigid Zones the growth of trees is prevented by the darkness and intense cold of winter. The vegetation consists of turf and low herbs, which are protected during the winter by a mantle of snow. The Arctic plains are usually covered by a growth of moss and lichens and of swamp-dwelling plants (hydrophytes).

*The Distribution of Animals.*—The chief facts of the distribution of animals (which is, of course, restricted by various factors, climatic and geographical) are summarized in the classifications of the world into different zoological regions.

Lydekker (1896) advanced a classification based mainly on the mammals, and having due regard to their geological history. He subdivided the world into three realms; of these Arctogeia includes Europe, Africa, Asia, and North America as far south as the Mexican Plateau. Canada and the Lake Region of the United States are included in the same subdivision, the Holarctic Region, as Europe and Asia. The United States, having a fauna very different from that of Europe and Canada, belong to an independent region, the Sonoran. Africa south of the Sahara and Southern Arabia form the Ethiopian Region, from which Madagascar is separated as the Malagasy Region. South-Eastern Asia is the Oriental Region. Lydekker's second realm, Neogea, includes South and Central America. His third realm, Notogea, includes four regions—the Australian, Polynesian, Hawaiian, and Austro-Malayan (the eastern part of the Eastern Archipelago).

The composition of the Arctogeia Realm is based on the occurrence on both sides of the North Atlantic of many animals, including the moles and beavers, bears, reindeer and elk, the grouse, and the salamander, and amongst freshwater fish, perches, sticklebacks, pike, and sturgeon. The characteristic animals of the Palearctic Region (Europe, Asia, and Mediterranean Africa) include the wolf, the hedgehog, fallow deer, the two-humped camel, yak, and in the far north the lemming. Many of its mammals are the same as those of the Ethiopian and Oriental Regions; the porcupine, for example, ranges northward from Africa into Italy, the apes to Gibraltar, and the lion, which is characteristically Ethiopian, lived until recently in the Atlas Mountains of North Africa, during Old Testament times in Palestine, and still survives in Western India. The Ethiopian Region is characterized by the African elephant, the hippopotamus, the two-horned rhinoceros, the giraffe, many species of antelopes, the earth-pig or Aardvark, the guinea-fowl, and (in Madagascar) the primitive lemur known as the Aye-Aye. The ostrich is typically Ethiopian, but ranges through Arabia as far north as Palestine. The Oriental Region is characterized by the Indian elephant, the tapir, the orang-utan, the flying-lemurs, and many special species of antelope. Some antelopes occur in

Northern Asia, and the tiger ranges from the jungles of India and Indo-China to Siberia. The Australian Region is specially characterized by including the few living representatives of the monotremes, and all the Marsupials except the American opossums and the South American opossum-rat (*Caenolestes*); the Australian Region includes amongst birds the birds of Paradise, the bower birds, the lyre birds, the cassowaries, and emus. New Zealand, which has no indigenous mammals, includes the remarkable three-eyed lizard, the Tuatera or Hatteria, and the wingless birds, the kiwis. The realm Neogea is the special home of the sloths and the ant-eaters, while it is occupied by special families of monkeys (the *Cebidæ*), the opossum-rat (*Caenolestes*), many special families of birds, including the great walking birds, the rheas; the llamas, vicuñas, and jaguars are its best-known larger animals. Many animals, doubtless of South American origin, such as the armadillos, range northward into the Sonoran Region of North America, along with humming-birds, pumas, and alligators.

*Animals of Economic Importance.*—The original distribution of domestic animals has been largely modified by man. He has taken with him in his wanderings those necessary for food, or as beasts of burden, or as companions. The chief animal foods, meat and milk, are supplied by cattle, which are now world-wide throughout the tropical and temperate zones. Sheep supply meat and wool, the most useful material for general clothing. The hair of the goat and the camel and the wool of the alpaca are all woven into textiles, and fur-bearing animals are of great value (see *Fur*). Silk is also an animal product, its range in climate being controlled by that of the mulberry, the food-plant of the silkworm. Transport animals include the horse, donkey, buffalo, ox, yak, elephant, camel, and reindeer, each being suited for travel over a particular kind of surface. The sea provides supplies of food-fish, which live at moderate depths mainly in the colder seas of the temperate zones. In the warmer parts of the temperate zone the chief sea-fish are the sardine and the anchovy. Of shell-fish the most important is the oyster, which grows in estuaries on temperate coasts. Fish are abundant in the tropical seas, but their flesh is usually

coarser. The most important freshwater fisheries are for salmon in the rivers of both sides of the North Atlantic and of Western Canada. See *Fisheries*.

*Plants of Economic Importance.*—In the tropics, owing to the heat and stimulus of the intense sunlight, plant growth, in the presence of ample moisture, is very rapid. Several harvests in the year may be reaped if the crops are supplied with water by irrigation, or by rain at suitable seasons. Owing to the heat, numerous products are developed, such as spices, rubber, oil, sugar, and starch, which are not produced, or only in smaller quantities, by the vegetation of colder climes. Hence modern civilization is dependent on the tropics for several essential materials. Cereals, on the other hand, which require slower growth and ripening, are characteristic of the temperate regions. The chief tropical and subtropical cereals are rice and millet.

The most valuable cereal is wheat, which thrives best under a cold wet spring and a hot dry summer, and so countries with a Mediterranean distribution of rainfall are especially adapted for wheat cultivation. Barley has a wider range in climate than any other cereal, being grown in Norway as far north as 70° N. lat. North African barley is particularly valuable for brewing. Oats are of service because they are easily cultivated, and can be raised in a colder and wetter climate than wheat. Rye grows on poor soil, and so is the chief crop of Eastern Europe. Maize, or Indian corn, is the chief grain native to America; it is there known as corn, and thus its flour is used in Europe under the name of corn-flour. Its growth requires a hot summer and repeated watering from frequent summer rains or irrigation. Rice is the cereal which is claimed to give a higher yield of food per acre than any other crop. It grows under special conditions in the subtropical climates—in China, India, Burma, and the Eastern Archipelago. Of the fruits, many of the most useful, including apples, pears, plums, peaches, oranges, and lemons, have been developed from trees native to the warmer temperate regions. Figs are grown especially in the Eastern Mediterranean. The vine is most prolific where, as in Southern Europe, the summer is long and warm, and the soil is dry.

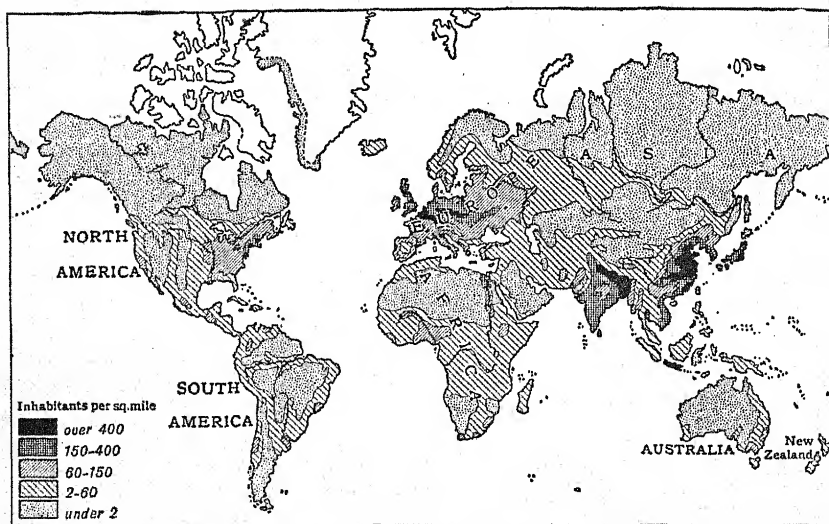
Sugar was primarily derived from sugar-



cane, which was a native of South-Eastern Asia; it is now spread throughout the tropics and subtropical lowlands, and requires for its growth a high temperature and ample moisture. Its chief rival is beet, which produces large supplies of sugar in the temperate zone in France, Germany, and South-Western Russia. Sugar beets are also grown in Britain. Spices, as a rule, require the heat of the tropics for the development of their aromatic constituents. Cloves and pepper

Formosa. The growth of coffee requires a warm moist climate, and it is now most extensively grown in East Africa, Arabia, and Brazil. Cocoa is the seed of an American tropical tree which is grown mainly in West Africa, but also in Brazil, Ecuador, and the West Indies.

Of the vegetable fibres the most important for clothing is cotton (q.v.), essentially a subtropical plant requiring a moderate amount of moisture. It grows chiefly in America, Egypt, the Sudan, and India.



The World—Density of Population

come from islands like Zanzibar and Pemba, off Equatorial Africa; cinnamon from Ceylon; nutmegs, &c., from the Spice Islands of the Eastern Archipelago. Tobacco (*Nicotiana*) is a native of America, and has now spread throughout the subtropical countries; the United States is still the largest producer. The most extensive cultivation of opium (extracted from poppies) was in India, in the Ganges Valley; but by improvements in culture the Indian poppy has been grown richer in morphine, and the opium-fields are now producing that most helpful drug morphia.

Tea thrives best with warm summers and frequent rain, and the chief tea plantations are in China, N. India, Ceylon, and

Of the coarser fibre plants used for textiles, one of the most important is jute, of which the main cultivation is in North-Eastern Bengal on sandy plains flooded in the spring. Flax grows under a wide range of climate, but requires a stiff moist soil. It is cultivated in North-Eastern Ireland; the main supply came from Russia, and it is now being largely grown in the highlands of tropical Africa. Of the fibres used for cordage and ropes, the most valuable grown in temperate regions is hemp, which is largely grown in Russia and Italy. Manila hemp, from the stem of the banana tree, and sisal hemp, from the leaves of a Central American aloe (now largely grown in East Africa), are important.

Fabrics are rendered waterproof by india-rubber, a secretion of many tropical trees which grow in South America, Africa, Malaya, and the East Indies.

Timber includes two chief sections: light woods, which are soft and easily worked, and hard woods, which are stronger, heavier, and often take a good polish. The light-wood trees are mainly coniferous, such as the pines and firs, which grow in vast forests, especially in the colder temperate regions. In the warmer temperate zones cedars and other conifers grow in forests mixed with other trees. The hard woods, oak, elm, ash, beech, chestnut, and walnut, grow in the temperate and tropical zones. The tropical forests produce woods such as mahogany, which are especially prized owing to their hardness, while teak, from the forests of Burma and India, has the strength of oak, with the advantage that metals driven into it are less liable to rust. The forests of Australia produce woods which are hard, beautiful in grain, and heavier than water, such as the iron bark, karri, and jarrah, which, owing to their exceptional strength and heaviness, and resistance to decay in water, are used for piles and blocks for road-paving.

**Minerals.**—The minerals first used by man were almost entirely such stones as flint, which could be easily chipped into cutting-tools; those of chief present service may be classified into five groups. (1) The ores of metals, which were first required for weapons, tools, and ornaments, and are now used also for constructional work and currency. (2) Fuels, which are essential for smelting metals, for domestic supplies in large cities, and for illuminants. (3) The commoner and more abundant earthy minerals used in building construction, such as clays and loams for bricks and tiles, rocks and marbles for building-stone, slates for roofing, limestone for cements, and tough rocks for road-metal. (4) Scarcer minerals, such as graphite, mica, and talc, used for various industrial purposes, and gems, used on account of their hardness, optical properties, or beauty. (5) Minerals required by the agriculturist to fertilize exhausted or barren soils. See such articles as *Mineralogy*; *Iron*; *Copper*; *Coal*; *Phosphates*; &c.; and articles on countries.

**The Races of Mankind.**—Mankind is divided into three primary sections: (1)

the Caucasian, a name now used in a purely conventional sense for most of the people of Europe, Northern Africa, and South-Western Asia, and for the settlers of European race in America, Australia, and South Africa; (2) the Mongolian, including the people of Central and South-Eastern Asia, the aboriginal tribes of America, and some European immigrants, such as the Lapps and Hungarians; (3) the Negro, including the natives of most of Africa, the Papuans, and Melanesians of the Eastern Archipelago. See *Ethnology*. For density of population see map.

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**Geok Tepe**, a town and fortress of Central Asia, oasis of the Akhal-Tekke-Turkomans. In 1879 the Russians under General Lomakine were defeated here with heavy loss, but in 1881 it was stormed by General Skobeleff after a three weeks' siege.

**Geology** is the science concerned with the investigation of the structure and the past history of the earth, and of the causes that have brought about its present surface-features.

The observation of deposits containing marine shells far removed from the present margins of the sea led Xenophanes, a philosopher of the sixth century B.C., to assert that these occurrences were due to an elevation of the ocean bed; and the fact that areas of sea and land had changed places was generally admitted by the naturalists of Græco-Roman schools. The revival of scientific thought during the Renaissance in the sixteenth century encouraged observation of the rocks themselves. For three more centuries, however, the changes in the relations of land and water were generally attributed, with Burnet, to violent convulsions, rather than, with Aristotle, to processes that went on

slowly in comparison with the span of human life.

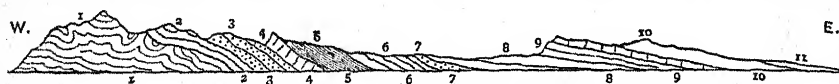
James Hutton, the Scottish philosopher, who wrote his *Theory of the Earth* in 1785, urged the immense importance of the factor of time in allowing comparatively small forces to modify profoundly the surface-features of the earth. The agents now in action tend to reduce the land areas to the level of the sea; but the products of decay accumulate in the ocean basins and form the substance of new continents. Hutton argued that this cycle of decay and reconstruction is repeated in the long history of the earth.

Hutton's arguments were expounded by his associate John Playfair, and expanded by Charles Lyell in his *Principles of Geology*. Meanwhile, William Smith had made one of the most far-reaching advances in the

Cuvier, the fishes so systematically studied by L. J. R. Agassiz, the shell-bearing cephalopods of L. von Buch, and the wealth of corals unfolded by Milne-Edwards and Haime, alike gained significance as parts of an impressive chain of animal forms.

The preservation of animals or plants as fossils depends almost entirely on the possession of parts that can be mineralized or can resist decay. Soft-bodied creatures, without protective covering, may have existed through æons of earth-history.

Following the principles of William Smith, geologists have divided the long range of fossiliferous rocks into *systems*, each system corresponding to a *period* of time bearing the same name. The periods are arranged in five great 'eras', each corresponding to a 'group' of



Succession and General Arrangement of Strata in Wales and Part of England

1, Cambrian and Ordovician. 2, Silurian. 3, Old Red Sandstone (Devonian). 4, Carboniferous Limestone (Carboniferous). 5, Coal Measures (Carboniferous). 6, Permian. 7, New Red Marl and Sandstone (Trias). 8, Lias. 9, Oolite. 10, Chalk, &c. (Cretaceous). 11, London Clay, &c. (Tertiary).

realm of science by showing, in his *Strata Identified by Organized Fossils* (1816), that the types of organisms entombed in rocks had varied by a regular sequence in geological time, and the way was open for the reception of a rational doctrine of descent.

**Stratigraphical Geology.**—Palæontologists soon observed that the change from the older to the newer faunas was more gradual than was at first supposed. Though breaks of great importance might occur in any one locality, yet these were seen to be due to a local change of conditions. Commonly in such cases the older series of strata are uptilted and folded, and the later series have been laid down across their denuded edges. Such a stratigraphical discordance is styled an *unconformity*. The time-interval represented by it may be enormous.

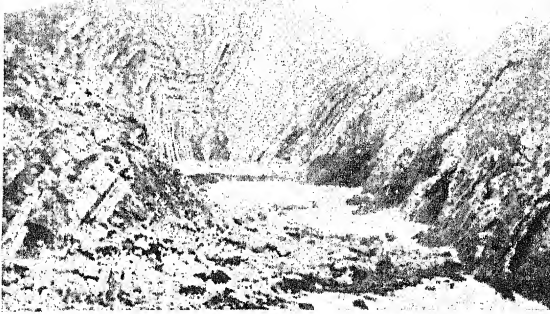
The publication of Charles Darwin's *Origin of Species* in 1859 gave a new meaning to palæontology, and a new incentive to the discovery of faunas and floras that might reduce the imperfection of the record. The extinct mammals of the Paris basin, reconstructed by Georges

systems. Archæan, implying high antiquity, has been used in more than one sense. Perhaps the name Proterozoic is that which is most applicable to fossiliferous or possibly-fossiliferous pre-Cambrian strata. Then follows the Palæozoic or 'old life' group; then Mesozoic or 'middle life'; then Cainozoic or 'recent life'. Many authors prefer to start a fifth era, the Quaternary (the Ger. *Quartär* is more correct), for the beds formed since reasoning man (*Homo sapiens*) appeared upon the earth.

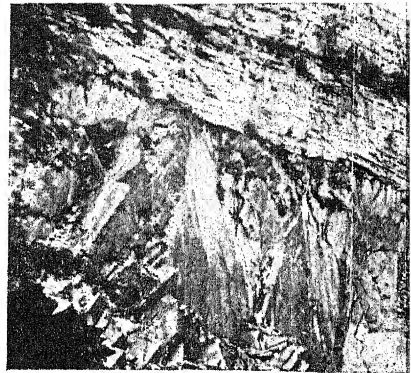
Details of the systems will be found under their separate names in this *Encyclopedia*; but a general table may be given here.

GROUP AND ERA.	SYSTEM AND PERIOD.
Quaternary.	Recent.
	Pleistocene.
	Pliocene.
Cainozoic or Tertiary.	Miocene.
	Oligocene.
	Eocene.
	Cretaceous.
Mesozoic.	Jurassic (sometimes divided in England into Oolitic and Liassic.)
	Trias.

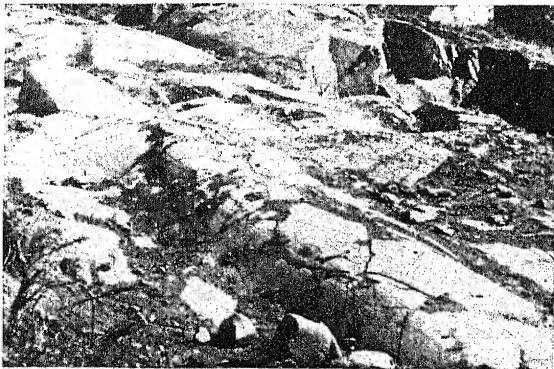
## GEOLOGY



Strata up-folded by earth-movement



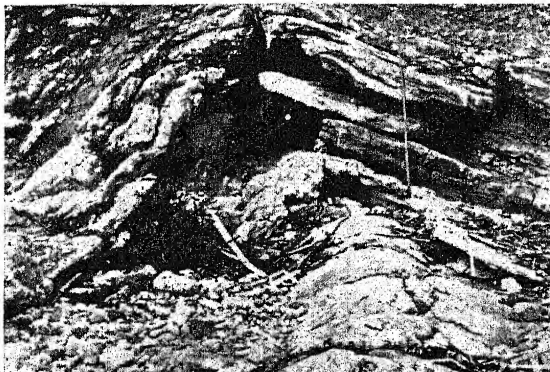
Unconformity, Carboniferous Limestone on S



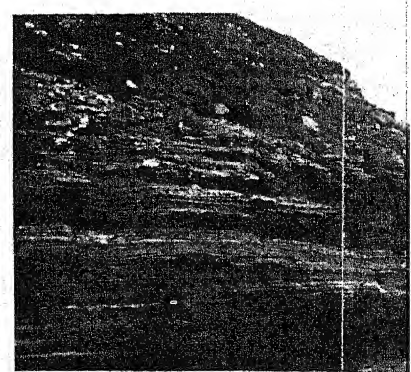
Rocks moulded by the passage of ice in the Glacial Epoch



Scratched Boulder in Glacial Clay



Anticline, Carboniferous Limestone



Stratified Rocks





GROUP AND ERA.	SYSTEM AND PERIOD.
<i>Paleozoic</i> (newer sub-group).	Permian. Carboniferous. Devonian.
<i>Paleozoic</i> (older sub-group).	Gotlandian (or Silurian as now generally restricted). Ordovician (formerly Lower Silurian). Cambrian.
<i>Proterozoic</i> or <i>pre-Cambrian</i> .	(In the absence of satisfactory faunas, not divisible into systems.)

The systems and periods are further subdivided into *series* and *epochs*, and these into *stages* (Fr. *étage*) and *ages*.

**Petrology.**—The scientific description of rocks grew naturally out of the study of their mineral constituents. It was largely developed by the treatises of mineralogists, and notably by R. J. Haüy (1801 and 1822) and Alex. Brongniart (1813 and 1827). A. G. Werner (1775 to 1817) was inspiring as a mineralogist, but exercised a retarding influence on geology by his views on the nature of what are now known as igneous rocks. The discovery by James Hutton, in Glen Tilt in 1785, of the intrusive character of granite put an end to the idea that rocks formed of crystalline silicates were necessarily older than all others in the district where they happened to occur. Rocks may be broadly divided into (1) those once molten (*igneous*); (2) those formed by the deposition of the products of rock-decay and denudation (*sedimentary*, with a subdivision called *aqueous* for rocks deposited in water); and (3) those in which considerable changes in structure, and often in mineral character, have taken place under earth-heat or earth-stresses or both. This third class is styled *metamorphic*. If the earth was once molten as a whole, the igneous rocks form a primary and fundamental series, from which all others have been derived. Their manifestations in upper regions of the crust are due to their ascent into cracks or domes formed respectively by crust-torsion or folding. The age of an igneous rock is that of its last consolidation; it is clearly younger than the rocks into which it has intruded, forming in their cracks wall-like sheets or *dykes*; on the other hand, pebbles from it may be found in some overlying stratum. Maximum and minimum ages can be thus assigned to it.

Metamorphic rocks offer greater prob-

lems and present far wider variations. Some of the foliated masses known as *schists* are clearly sediments in which the minerals have developed under the influence of hot vapours. Some of the felspathic and coarser metamorphic rocks, the *gneisses*, are granitoid masses that have been partly crushed and caused to assume a solid flow. The foliated gneisses, long deemed to be fundamental, have been found to result from injection of igneous matter into some still older series. The foundation-stones of the accessible crust are sediments, and were formed by processes of denudation. Despite of all attempts to cast aside a rigid 'uniformitarian' dogma, the teaching of Hutton remains paramount—as far back as we can penetrate into the history of rocks, the processes that controlled their formation are those in operation at the present day.

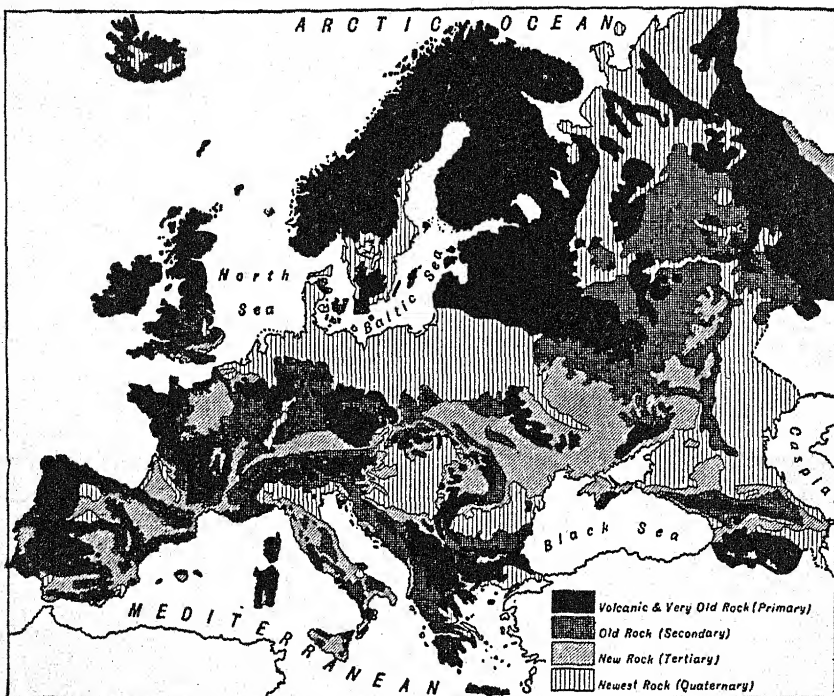
**Structural Geology.**—The bending of strata into ridges known as *anticlines*, and down-bent basins known as *synclines*, is frequently revealed in quarry-sections. An anticline is an elongated dome; a syncline is a spoon-shaped downfold. The tilted stratum is said to *dip* at such and such an angle to the horizon, and the direction of a horizontal line drawn on the surface of a bed is that of the general run or *strike* of the uptilted strata across the country.

A series of anticlines may become pushed from one side and overfolded, until they resemble almost horizontal sheets. In these *recumbent folds* the succession of strata of course becomes reversed in the lower limbs of the anticlines, which are also the upper limbs of the synclines. An overfold may part in the middle, and its upper limb may progress along a *thrust-plane*, a fault of low angle to the horizon, until rock-masses are imported into a district ten or twenty miles from their place of origin.

**Paleontology.**—Our knowledge of the earliest forms of life is derived from the study of fossil remains. We look back to the Cambrian period, and see a world in which primitive crustacea already existed, in which corals, brachiopods, and even specialized molluscs inhabited the sea, but in which browsing trilobites were the dominant forms of life. In the Gotlandian (Silurian) period their supremacy was threatened by great arachnids, the

eurypterida, marine allies of the scorpions, while scorpions and even beetles appear upon the land. Side by side with them fishes appear, the first recorded vertebrates. In Devonian times fishes, in some cases protected by an armour of interlocked bony plates, in others bold and aggressive, and attaining a length of 30

well-armoured forms they tramped about the land, at times 100 feet long. Light forms lived in the trees, perhaps for safety, and from these, in Upper Jurassic times, the feathered race of birds arose. In Cretaceous times swimming birds existed; but the pterosaurs, the flying reptiles, still held the kingdom of the air, while the



Geological Map of Europe

feet, dominated the lakes and seas. The amphibia head the vertebrate series in the Carboniferous period, but in the Permian of Texas, Russia, and South Africa reptiles of varied types appear. The dinosaurs developed in the Trias, side by side with small mammals of humble and marsupial type. The reptiles took to the ocean as swimming saurians 50 feet in length; they swept through the air on wings supported by an extended finger of the hand; in bulky and often

dinosaurs showed no diminution in variety and vigour on the land. Our modern type of flora, with familiar genera of flowering trees, arose in the middle of the period. And then, probably swept by some wind-borne or insect-borne bacterial disease, the whole empire of the reptiles crumbled. The mammals, that had been so long kept under, became heirs of land and water, and even, as delicate bats, essayed the air. The unspecialized Phenacodus of the Eocene leads on to the tapir, the rhino-

ceros, and the horse. Eocene whales are known, and lemurs foreshadow the ingenious race of apes. Though remains are scanty, the line of the primates hereafter forms one of the main attractions of palæontology.—BIBLIOGRAPHY: A. Geikie, *Text-book of Geology and The Founders of Geology*; C. Lyell, *Principles of Geology*; E. Suess, *Das Anlitz der Erde* (preferably in the annotated and illustrated French edition, *La Face de la Terre*); K. A. von Zittel, *History of Geology and Palæontology*; A. C. Seward, *Fossil Plants*.

**Geometry**, the branch of mathematics which deals with the properties of space. Geometry is *plane*, *solid*, or *spherical*, according as it deals with figures in a plane, in space of three dimensions, or on the surface of a sphere. *Pure* geometry proceeds by deductive reasoning, and never loses sight of the figure; *analytical* geometry makes use of co-ordinates, and tends to become a branch of algebra. *Metrical* geometry is concerned with measurements, such as those of length, area, and angle; *projective* geometry considers graphical properties not involving measurement, properties, e.g., relating to the intersection of lines, or the collinearity of points. *Descriptive* geometry deals with the representation of solid bodies by means of plane figures.

The history of geometry commences in Greece. Pythagoras, Plato, Euclid, Archimedes, and Apollonius were some of the great Greek geometers. Descartes introduced co-ordinates, and Monge descriptive geometry. Steiner in Germany and Chasles in France were famous pure geometers. Von Staudt placed projective geometry on a basis independent of measurement. In modern times, analytical geometry has far outstripped in range and power the ancient synthetic method; Plücker, Cayley, Sylvester, Salmon, Hesse, and Clebsch were some of its exponents. Non-Euclidean geometry, a theory in which Euclid's axiom of parallels is supposed not to hold good, has been developed by Bolyai, Lobatchewsky, Gauss, Riemann, Beltrami, Cayley, and Klein. The foundations of geometry have been discussed by Helmholtz, Lie, Peano, and Hilbert. The modern theory of relativity is in one aspect a geometry of space-time.

**George I** (George Louis) (1660–1727), King of Great Britain and Elector of Hanover. In 1698 he succeeded his father

as Elector. He commanded the imperial army in 1707 during the War of the Spanish Succession; and ascended the throne of Great Britain on the death of Queen Anne in 1714. He left a son, George, afterwards George II of England, and a daughter, Sophia, the mother of Frederick the Great.

**George II** (George Augustus) (1683–1760), King of Great Britain. In 1727 he succeeded his father on the English throne. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy who then adorned England. The War of the Austrian Succession, in which George II himself took part at Dettingen, the Jacobite rebellion of 1745, the conquest of Canada, and the growth of the British Empire in India are amongst the chief events of his reign.

**George III** (1738–1820), King of Great Britain. He was the eldest son of Frederick, Prince of Wales, and succeeded his grandfather, George II, in 1760. George III was a man of conscientious principles and of a plain, sound understanding, though his narrow patriotism and his obstinate prejudices were hurtful to British interests. His private life was exemplary. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death his biography is a blank. Queen Charlotte bore him fifteen children—nine being sons.

**George IV** (1762–1830), King of Great Britain. His dissipated life, his extravagance, his supposed (and actual) marriage with a Catholic, Mrs. Fitzherbert, alienated from him the affection of his father and the esteem of the nation. In 1795 he married the Princess Caroline of Brunswick, from whom he soon separated, and who was afterwards tried for adultery in 1820. In 1811 George became regent, and on the death of George III in 1820 king.

**George V** (1865– ), King of Great Britain, Ireland, and of the oversea British dominions, Emperor of India, second son of Edward VII and Queen Alexandra. He became a naval cadet, and as a midshipman visited many parts of the world. He attained the rank of commander in 1891. In 1893 he married Princess Victoria Mary, daughter of the Duke of Teck. This union has produced five sons and one daughter, the eldest,



Prince Edward, having been born on 23rd June, 1894. On the death of Queen Victoria and accession of Edward VII (22nd Jan., 1901) he became Duke of Cornwall, and later in the year was created Prince of Wales. The Prince and Princess of Wales spent the winter months of 1905-1906 in India, visiting Calcutta and other cities. On the death of Edward VII, 6th May, 1910, the prince became king as George V, and on 22nd June, 1911, he and his consort, Queen Mary, were crowned in Westminster Abbey.

**George I** (1845-1913), King of the Hellenes, was the second son of the King of Denmark. In 1863 he was elected king by the Greek National Assembly. He was assassinated at Salonica.

**George, Henry** (1839-1897), American writer on political economy and social reform. He became a journalist and editor of papers, and in 1879 published *Progress and Poverty*, a work that attained an enormous circulation. In it many of the older views of wealth, wages, and capital are attacked. His other works include: *Our Land and Land Policy*; *Social Problems*; *Property and Land*; and *Protection and Free Trade*, a defence of the latter.

**George**, the name of several lakes in various parts of the world. (1) In the south-west of Uganda, forming the north-east extension of Lake Edward. (2) A salt lake in New South Wales, an isolated basin with no outlet. (3) A lake in New York State, among the Adirondacks, south of Lake Champlain, into which it discharges.

**George**, a town, Cape Province, South Africa, 32 miles from Mossel Bay and 4 miles from the sea. It is a favourite health-resort. Pop. 4793.

**George, St.**, the patron saint of England. His origin is very obscure, one of many legends representing him as a prince of Cappadocia martyred by Diocletian. The killing of a dragon that was about to swallow a maiden is a legendary feat attributed to him. The story first appeared in the Middle Ages in the *Legenda Aurea* of Jacobus de Voragine. It is plainly derived from the story of Andromeda and Perseus. St. George was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (the 23rd of April) should be observed as a national holiday in England; in 1350 he was made the

patron saint of the Order of the Garter by Edward III.

**George Town.** See *Penang*.

**Georgetown**, or **Demerara**, the capital of British Guiana, at the mouth of the Demerara. There is a bar at the mouth of the river, and large ships have to discharge and load by means of lighters. Georgetown has a number of churches, schools, and hospitals. The chief exports are sugar, rum, and coffee. Pop. 55,278.

**Georgia**, a Socialist Soviet Republic, one of the constituent states of the Transcaucasian Socialist Federal Soviet Republic. It is bounded by the Black Sea, the Caucasus Mountains, Azerbaijan, and Armenia, and is composed of the former Russian provinces of Tiflis and Kutais, the Autonomous Socialist Soviet Republics of Abkhazia (part of the former province of Sukhum) and Adsharsk (formerly Batum province), and the Autonomous Region of Yugo-Osetie in the Caucasus Mountains. The total area is 26,589 sq. miles and the population 2,660,961. The capital is Tiflis, the chief seaports are Poti and Sukhum, and, of course, Georgia has the right of using the free port of Batum, which is in Ajaria. Georgia is mainly a pastoral and an agricultural country, and offers great scope for development in these industries. The principal crop is corn, and the country is rich in fruit trees, the wine industry being important. Silk production and bee-keeping are extensively carried on. The minerals include naphtha, copper, coal, lead, manganese, iron, sulphur, zinc, and antimony. Of these the most important is manganese, which is mined at Tchiaturi. There are vast possibilities in the mineral wealth of Georgia, especially in petroleum. There are 970 miles of railway track in Georgia, and several extensions are under construction. The Georgians are a fine-looking race, the women being renowned for their beauty. Their language, which is allied to those of other Caucasian races, is a member of a distinct linguistic family, and their literature, which commences with the introduction of Christianity into the country, is especially rich in lyric poetry. There is a Georgian Bible. Georgia is known to have been subject to Alexander the Great, and to have become independent in 324 B.C. Christianity was introduced in the fourth century. After a period of subjection to the Arabian

caliphs, the Georgians remained independent from the end of the tenth century till 1799, when their king ceded his dominions to the Russian Emperor Paul. There ensued a period of subjection which seemed to doom Georgian nationalism, but after the Russian Revolution in 1917 the Transcaucasian Republic of which Tiflis was the centre was formed, and in 1918 Georgia declared her absolute independence. The Act of Independence was formally approved in 1919 by the Constituent Assembly, and the Government was recognized *de jure* by the Allies in 1921. In this year it was overrun by Bolshevik forces, subdued, and formed with Armenia and Azerbaijan into the Transcaucasian federation (T.S.F.S.R.). The Constitution of Georgia is now the same as that of Soviet Russia (q.v.).—BIBLIOGRAPHY: Foreign Office Handbooks, *Caucasia*; Karl Kautsky, *Georgia: a Social Democratic Peasant Republic*; M. Wardrop, *Georgian Fairy Tales*; O. Wardrop, *The Kingdom of Georgia*.

Georgia, one of the southern United States of America, with an area of 59,265 sq. miles. The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea-island cotton is raised. The land is low towards the coast, beginning as a salt marsh, continuing next as swampy rice plantations and then as 'pine barrens', gradually rising as a sandy district, interspersed with fertile tracts, till it reaches the lower falls of the Savannah, Ogeechee, Oconee, and other rivers. Here the hilly and finally mountainous region called the Upper Country begins, a fertile and salubrious region extending north and west till it rises into the Appalachian mountain chain. Of the rivers the Chattahoochee, which flows under the name of the Appalachicola into the Gulf of Mexico, the Savannah, and the Altamaha and its affluents are navigable. Cotton, rice, maize, and the sugar-cane are the staple productions; but tobacco, the sweet potato, and other crops are cultivated with success. The fruits, which include peaches, apples, melons, oranges, bananas, &c., are of the finest. Copper and iron, also gold in considerable quantities, are found in the northern parts. Atlanta is the seat of the legislature and largest town; the other principal towns are Savannah (the chief seaport), Augusta,

Macon, and Columbus. A charter for the foundation of a colony in the territory now called Georgia was obtained in 1732 from George II, after whom the state was named. Georgia was one of the thirteen original states. In 1788 it adopted the Constitution of the United States by a unanimous vote. In Jan., 1861, Georgia seceded with the Confederates, took an active part in the Civil War, and was conquered by a Federal army. Pop. 2,895,832 (including 1,200,000 negroes).—BIBLIOGRAPHY: C. C. Jones, *History of Georgia*; U. B. Phillips, *Georgia* (American Commonwealth Series).

Georgia, Gulf of, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver Island. It communicates with the ocean on the north by Queen Charlotte's Sound, and on the south by the Straits of Juan de Fuca.

Georgia Bark (*Pinckneya pubens*), a small American tree resembling Peruvian bark, with white flowers, and belonging to the nat. ord. Rubiaceae. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

Georgian Bay, the north-eastern part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the Island of Great Manitoulin. It is about 120 miles long and 50 miles broad.

Gera, chief town of Thuringia, Germany, on the right bank of the Elster, 35 miles s.s.w. of Leipzig. It has manufactures of woollen, linen, cotton, and other goods. Pop. (1925), 81,402.

Geraniaceæ, a natural order of Dicotyledons, the distinguishing characteristic of which is to have a fruit composed of five capsules or cases, connected with as many flat styles, consolidated round a long conical beak, giving some of the species the name of stork's-bill and crane's-bill.

Geranium, the typical genus of the order Geraniaceæ, popular name crane's-bill. Herb-robert is the most common of the British wild species, of which there are about thirteen. The American variety, *G. maculatum*, called alum-root, is used in medicine.

Gérard, Étienne Maurice, Count (1773-1852), French soldier. In 1813 he was made a general of division and count. He took an active part in the revolution of 1830,

commanded the troops which reduced Antwerp in 1832, became Prime Minister in 1834, and commander of the National Guard in 1838.

Gérard, François Pascal, Baron (1770-1837), French historical and portrait painter. He was much patronized by Napoleon, for whom he painted the *Battle of Austerlitz*, and was made a baron by Louis XVIII after completing his large painting of the *Entrance of Henry IV into Paris* (in the Museum of Versailles).

Gerard, James Watson (1867- ), American jurist and diplomatist. In 1913 he was appointed United States Ambassador to Germany, and remained in Berlin until 1917, when America entered the European War. During the first two years of the European War, Gerard greatly interested himself in the welfare of war prisoners. He published *My Four Years in Germany* (1917) and *Face to Face with Kaiserism* (1918).

Gérard de Nerval, the pseudonym of Gérard Labrunie (1808-1855), French man of letters. Amongst his best works are his short tales and sketches, *Scènes de la vie orientale*, *Voyage en Orient*, *Contes et facéties*, *La Bohème galante*, &c.

Gerbillus, a genus of small burrowing rodents (the gerbils), of the family Muridae (mice), found in Africa and Asia.

Gerhardt, Paul (1607-1676), German hymn writer. A strict Lutheran, he opposed energetically all attempts to unite the Lutheran and Reformed Churches. His excellent book of hymns appeared at Berlin in 1667 (*Geistliche Andachten*). Many particular hymns have found English translators, such as: *Commit thou all thy griefs*; and *Jesus, Thy boundless love to me*.

German, Sir Edward (1862- ), British composer. His incidental music to *Henry VIII* (1892) and to *Nell Gwyn* (1900) is well known. He completed *The Emerald Isle*, an opera left unfinished by Sullivan (produced in 1901), and also composed the scores of the light operas *Merrie England* (1902), *A Princess of Kensington* (1903), and *Tom Jones* (1907). He has also composed many orchestral symphonies and songs. His music is distinguished by tunefulness and a quaint old-world air. He was knighted in 1928.

Germander, the common name of three British plants of the genus *Teucrium*, order Labiateæ, namely *T. Chamædris*, wall-

germander, *T. scordium*, water-germander, and *T. scorodonia*, wood-germander or wood-sage.

German East Africa. See *Tanganyika Territory*.

Germanicus, Cæsar (15 B.C.-A.D. 19), Roman general. He was adopted by Tiberius, his paternal uncle, and married Agrippina, the granddaughter of Augustus. When Augustus died, Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty, but refused. Next year (A.D. 15) a campaign against the Catti and the Germans, led by Arminius, resulted in a series of victories. Tiberius now became jealous of Germanicus, and sent him into the East to compose the disturbances in Armenia and Cappadocia. He died on his return to Syria under some suspicion of having been poisoned.

German Republic of the Volga, an autonomous region of Soviet Russia on both banks of the River Volga, occupying the former provinces of Samara and Saratov; area, 7600 sq. miles; pop. 454,368 (67 per cent Germans settled in time of Catherine the Great). Marxstadt, the capital, is about 400 miles north of Astrakhan.

German Silver. See *Nickel*.

German Tinder, or Amadou, is prepared from the *Bolëtus fomentarius*, a fungus growing on the oak, birch, and some other trees, or from the *Bolëtus igniarius*, found on the willow, cherry, plum, and other trees.

Germany, a Central European federation of republics corresponding to the former German Empire. It is bounded by the North Sea, Denmark, the Baltic Sea, Poland, Czechoslovakia, Austria, Switzerland, France, Luxembourg, Belgium, and Holland. East Prussia, a Baltic district of Prussia (lying south of Lithuania), is separated from the rest of Germany by the Polish Corridor. The table on the opposite page gives the areas and populations of the various constituent states. The area is 26,567 sq. miles less than that of the Empire in 1914. This is accounted for by the cession (Treaty of Versailles, 1919) of Alsace-Lorraine to France, of Eupen and Malmédy to Belgium, of Memel (now part of Lithuania) and Danzig (now a free state) to the Allies, of part of Upper Silesia to Czechoslovakia, and of parts of West Prussia, Posen, Eastern Silesia, and

German Republics.	Area in Sq. Miles.	Population, 1925.
Prussia .. ..	113,036	38,175,989
Bavaria .. ..	29,343	7,379,594
Württemberg .. ..	7,532	2,580,235
Baden .. ..	5,819	2,312,462
Saxony .. ..	5,789	4,992,320
Mecklenburg-Schw. ..	5,066	674,045
Thuringia .. ..	4,537	1,609,300
Hesse .. ..	2,970	1,347,279
Oldenburg .. ..	2,480	545,172
Brunswick .. ..	1,418	501,875
Mecklenburg-Str. ..	1,131	110,269
Anhalt .. ..	800	351,245
Lippe .. ..	409	163,648
Schaumburg-Lippe ..	131	48,046
Hamburg .. ..	100	1,132,523
Lübeck .. ..	115	127,971
Bremen .. ..	90	338,846
Saar District .. ..	738	768,000
Total .. ..	181,723	63,178,619

East Prussia to Poland. As the result of a plebiscite taken in 1920, Northern Schleswig (now known as Slesvig) was transferred to Denmark. Upper Silesia, which by a plebiscite in 1922 decided for annexation to Germany, was nevertheless transferred to Poland. The inhabitants of the Saar Basin (see *Saar*), which is under French control, will decide the future of the territory by plebiscite in 1934. The Ruhr Valley was occupied by the French from 1923 till the signing of the London Agreement accepting the Dawes Plan in 1924 (see *Ruhr*). The Cologne Zone of the Rhineland area in Allied occupation (see map on p. 231) was evacuated subsequent to the signing of the Locarno Pact (see *Locarno*) in 1925.

Southern Germany is in general hilly, and the alpine region comprises parts of Bavaria, Württemberg, and Baden. North of this the Suabian-Bavarian Plateau extends to the mountain range of Central Germany, where are the ranges bounding Bohemia (Czechoslovakia) and the Harz Mountains. North of this the great European Plain extends to the sea. Germany is very well watered, its central mountain system forming part of the great watershed of Europe. The most important rivers are the Oder, flowing to the Baltic; the Elbe with its tributaries the Weser and the Havel, flowing to the North Sea; the middle course of the Rhine with its affluents the Main, Ruhr, &c.; and the upper reaches of the Danube. All these

ivers are navigable. There are lakes on the Baltic seaboard and in the alpine region, and at the mouths of the Niemen and the Oder are great freshwater lagoons (*haffs*). The islands are Rügen in the Baltic, and Heligoland and the East Frisians in the North Sea. Berlin is the capital of the Republic, and the chief sea-ports are Hamburg, Bremen, Bremerhaven, Stettin, Königsberg, and Lübeck.

Agriculture is an important industry all over Germany, and in 1928 the soil was subdivided as follows (in acres): arable land, 51,556,972; grass, meadows, &c., 20,165,876; orchards, 122,212; vineyards, 204,575; forests, 31,259,000; all other, 12,000,000. The principal crops are rye, wheat, barley, oats, potatoes, sugar-beet, tobacco, flax, and hemp. In 1928, 45,000,000 gallons of wine and 1,675,000 metric tons of sugar were produced. Forestry is an industry of great importance, and is carefully superintended by the State, which owns forests covering almost 10,000,000 acres. There are North Sea and Baltic Sea fisheries. Germany is rich in minerals, the chief mining districts being Westphalia, Rhenish Prussia, and Silesia for coal and iron, the Harz for silver and copper, and Silesia for zinc. There are coal-, iron-, and silver-mines in Saxony. In 1928 the output of coal was 150,860,000 tons, and of lignite 165,588,000 tons. Potash is also a valuable mineral, the annual production being about 10,000,000 to 12,000,000 tons. The chief centres of iron and steel manufacture are the Ruhr, the Saar, Silesia, Westphalia, and Thuringia, and the chemical industry is centred on the Rhine, the Ruhr, and in Saxony. Saxony is the centre of the textile manufacture, though linen is produced in Westphalia and Silesia, cotton in Württemberg, Baden, and Bavaria, woollens in the Prussian provinces, and silk in Rhenish Prussia and in Baden. There are 248 beetroot sugar factories in Prussia, Brunswick, Anhalt, Bavaria, &c., and over 40,000 distilleries in various parts of the country. There are about 3000 breweries. Other manufactures are glass, porcelain, and earthenware in Silesia, Thuringia, and Bavaria, and clocks and woodenware in Bavaria and Württemberg.

The unsettled state of Germany and the fact that a certain amount of territory was in Allied occupation made it impossible to issue reliable trade statistics for several



years after the European War. The following statement of trade for 1928 is, however, complete and official. In that year the value of German exports was 9,229,000,000 gold marks, and of imports 12,011,000,000 gold marks. The chief exports were coal, iron, potash, paper goods, machinery, and sugar. In the following table the exports of 1918 and 1928 are compared, the figures representing millions of gold marks:

	1913.	1928.
Live-stock .. .. .	7.4	18.8
Food-stuffs, &c. .. .	1069.5	630.9
Raw materials and semi-manufactured articles .. .	2274.1	2703.6
Finished articles .. .	6746.2	8701.5
Gold and silver .. .	101.4	31.9

In 1928 Britain imported from and exported to Germany goods valued at £63,725,716 and £40,946,970 respectively. The German mercantile marine amounted in 1929 to 4,092,552 tons, compared with 5,135,000 tons in 1914. In 1928 there were 86,255 miles of railway track in Germany, and 7614 miles of navigable waterways (1372 miles being canals). The standard currency unit is the gold mark (normal value 11½*d.*), but the actual unit is the paper mark. In 1923, in order to secure stabilization a currency, called the *rentenmark*, was introduced. In 1924 the currency was re-established on a gold basis, and the par value of the Reichsmark is now 11½*d.* stg. The metric system of weights and measures is in force.

The Constitution of the German Republic was adopted and promulgated in 1919. It provides for Central and State legislative organs, and for an Imperial Council (*Reichsrat*) formed to represent the component states (*Länder*). The legislative body of the Republic is the *Reichstag*. The entire power of the State is derived from the people.

By the Treaty of Versailles and by a law passed by the *Reichstag* in 1919 the German Imperial Army was disbanded and a permanent defence force (*Reichswehr*) was established. Enlistment in this force is voluntary, and the total strength is 100,000 men. The equipment of the German army is definitely limited by the Treaty of Versailles, and no military aircraft is permitted. Most of the fortresses

and coast defences have been razed. The German navy is merely a coast defence force, and its ships are of little fighting value. The total permitted personnel is 15,000 men, and no submarines are allowed.

There is no State religion, but the Constitution provides for entire liberty of conscience. According to the census of 1925, the territory of Germany contained 40,000,000 Protestants, 20,000,000 Roman Catholics, and 565,000 Jews. Education is compulsory and well organized. Secondary schools include *Bürgerschulen* (which give a business training), continuation schools, *gymnasien* ('classical' schools), *realschulen* ('modern' schools), and various other high schools for boys and girls. There are 10 technical high schools and several veterinary, agricultural, afforestation, mining, and commercial colleges. There are also 16 schools of art and 11 colleges of music. There are 23 universities in Germany. See also articles on the various constituent republics.

*History.*—The date of the first arrival of the Germanic or Teutonic races in Europe is unknown. At the close of the second century B.C. Germanic tribes called Cimbri and Teutones left their homes in the Danish peninsula, and descending upon Italy were defeated by Marius at Aquæ Sextiæ (Aix in Provence) and Verceilæ in Northern Italy. The Romans did not come again in contact with the Germans till Caesar's invasion of Gaul brought on a contest with the Suevian prince Ariovistus (58 B.C.). Under Augustus a systematic attempt was made to subjugate the vast and little-known region Germania. Tiberius reduced all the tribes between the Rhine and the Elbe, but a few years later there was a revolt, in which three Roman legions under Varus were annihilated by Arminius, leader of the Cherusci, about A.D. 9. The attempt to subjugate the Germans was given up by Augustus; and Germanicus, although he avenged the defeat of Varus by a succession of campaigns, failed to recover the Roman ascendancy.

As the aggressive force of the Roman Empire abated, it continued to be more and more subject to the incursions of the Germans, who by the end of the fifth century had overrun Gaul, Italy, Spain, and part of Africa. After this Germany itself continued in a divided state till it came under the single rule of Charlemagne

(see *France*). The history of the German Empire properly commences with the Treaty of Verdun (A.D. 843), which separated the land of the Eastern Franks under Ludwig the German from that of the Western and Central Franks. Out of Ludwig's kingdom was developed the German nationality. Charles the Fat became emperor in 881, and three years

his successor. He died in Dec., 918. In 919 Henry the Fowler, Duke of Saxony, was elected. He was succeeded by his son Otto the Great in 936, who revived the empire of Charlemagne, receiving the crown of the Holy Roman Empire from the Pope in 962. He died in 973, and was succeeded by his son Otto II, who had been crowned emperor by the Pope in



In 1925 as a result of the Locarno Pact the Cologne Zone was evacuated, the British H.Q. being removed to Wiesbaden

later was also elected King of the West Franks, thus again uniting under one sceptre the monarchy of Charlemagne. After his deposition in 887 the two territories of the Eastern and Western Franks were again separated, the former electing Arnulf as their king. He died in 899, and was succeeded by his infant son Louis, who was proclaimed King of Lorraine in 900, assumed the title of emperor in 908, and as such is designated Louis IV. He died in 911, and the German nations chose Conrad, Count or Duke of Franconia, as

his father's lifetime. Henry II, Duke of Bavaria, surnamed the Saint, the hereditary heir of the Saxon line, was elected at Mainz, on the death of Otto in 1002, crowned emperor in Rome 1014, and died in 1024. With him ends the Saxon line of emperors.

Conrad II, surnamed the Salic, a Franconian nobleman, was chosen to succeed him. He died in 1039. He was succeeded by his son Henry III, who exercised more despotic authority in Germany than any of his predecessors. The fruits of his

policy were lost by his son Henry IV (1056-1106). In his reign occurred the famous quarrel with the Pope regarding investitures, settled by the Concordat of Worms (1122) in the reign of Henry V (1106-1125).

A contest was now begun between the Saxon and Hohenstaufen (Suabian) families, in which the celebrated party names Guelph and Ghibelline originated. On the death of Lothaire in 1138 Conrad III (of Hohenstaufen) was chosen to succeed him. Conrad died in 1152, and was succeeded by his nephew Frederick Barbarossa. His son Henry VI began his reign with a war in Southern Italy. He conquered Sicily, and was crowned king of it in 1194. He died at Messina in 1197. Philip, brother of Henry, and Otto IV were elected by rival factions in 1198. Philip, who was successful, was assassinated in 1208. Otto IV, the son of Henry the Lion, was recognized by the Diet of Frankfort in 1208 as the successor of Philip. He attempted the conquest of the Two Sicilies without success, and died in 1218. Frederick II, King of the Sicilies, was elected emperor in 1212. His life passed in contentions with the Popes and the Lombard cities. He died in 1250. Conrad IV, his son, had to contend against William of Holland. He died in 1254. He was the last emperor of the House of Hohenstaufen, which became extinct on the death of his son. His successor, William of Holland, was slain in Friesland in 1256. Richard, Earl of Cornwall, and Alfonso X, King of Castile, were chosen emperors in 1257; but the internal divisions of Germany had already deprived the office of all authority, and neither of them had any power. Until 1273 the German Empire had no real head.

Rudolph, Count of Habsburg and Cyburg, the most powerful prince in Helvetia, was chosen emperor (1272). He died in 1291. Adolphus of Nassau, his successor, was deposed in 1298 by the Diet of Mainz. Albert I, son of Rudolph, was chosen emperor the same year. He died in 1308, and was succeeded by Henry VII of Luxembourg, nearly the whole of whose reign was passed in Italy, where he died in 1313. In 1314 a double election took place; Frederick, Duke of Austria, sometimes called Frederick III, was elected along with Louis of Bavaria. On the death of

Frederick in 1330 the latter became sole emperor. He died excommunicated and deposed in 1347. Charles IV, King of Bohemia, was elected in 1346. He died in 1378. Wenceslaus, his son, was deposed for his excesses in 1400. Rupert, Count Palatine, elected 1400, possessed little authority. Sigismund, King of Hungary and Bohemia, son of Charles IV, was elected by a party in 1410. He died in 1437. Albert II (V of Austria) was elected in 1438, and died in 1439. He was succeeded by Frederick III, Duke of Styria and Carinthia. He was the last emperor who was crowned in Rome. Henceforth the German emperors were always of the House of Austria. He died in 1493. His son Maximilian I succeeded.

Since its rise the empire had undergone many changes. At the extinction of the Carolingian dynasty Germany was divided into five nations or dukedoms—Franconia, Suabia, Bavaria, Saxony, and Lorraine. Henry the Fowler and the Ottos added the marches of Austria and Misnia; Henry the Lion and Albert of Brandenburg, Mecklenburg and Pomerania. The House of Austria added Styria, Carinthia, Carniola, and the Tyrol. But Switzerland had been lost, and the old Burgundian territories of the empire, Franche Comté, the Lyonnais, and Provence, had gone to consolidate the French monarchy under Louis XI. Bohemia and Hungary, and many of the Italian cities, especially in the north, were also connected with the empire, but the connexion was more formal than real, and the circles established by the Diet of Cologne (1512) represented at that time the estates of the empire, viz. (1) Austria; (2) Bavaria; (3) Suabia; (4) Franconia; (5) the Upper Rhine (Lorraine, Hesse, &c.); (6) the Lower Rhine, or the Electorates (Mainz, Trier, Cologne); (7) Burgundy (Netherlands); (8) Westphalia; (9) Lower Saxony (Brunswick, Lüneburg, Lauenburg, Holstein); (10) Upper Saxony (Saxony, Brandenburg, Pomerania).

Maximilian was succeeded in 1519 by his grandson Charles V. His reign, the most important in the German annals and the most brilliant in the sixteenth century, was divided among three great conflicts—the continued struggle between France and Germany, the conflict with the encroaching Ottoman Empire, and that with the Reformation. In 1556 Charles resigned the empire to his brother Ferdi-

nand. The Council of Trent was concluded in Ferdinand's reign. He died in 1564. Then followed Maximilian II, Rudolph II, Matthias, and Ferdinand II. By this time was begun a religious war, by which Germany was devastated for thirty years, hence called the Thirty Years' War.

The invasion of Germany by Christian IV of Denmark in 1625, the Peace of Lübeck (1629), the invasion of Gustavus Adolphus (1630), the battles of Leipzig in 1631, of the Lech and Lutzen in 1632, of Nördlingen in 1634, the war with France in 1635, are the chief events of the Thirty Years' War. Ferdinand died in 1637, and was succeeded by his son Ferdinand III. Ferdinand III had gained a military reputation at the battle of Nördlingen, but Banér, Bernhard of Saxe-Weimar, Torstenson, Turenne, and the Great Condé gained repeated victories over his troops. He was at length induced to enter into negotiations; and the Thirty Years' War was concluded by the Peace of Westphalia (24th Oct., 1648), in which the policy of France and Sweden was triumphant. The principal conditions which concerned Germany were a general amnesty and restoration of rights. France received definitively the bishoprics of Metz, Toul, and Verdun, with Breisach, Upper and Lower Alsace, and ten imperial cities in Alsace. Sweden received Rügen, and Hither Pomerania and part of Farther Pomerania, with some other territories. Greater power was given to the Protestants; and the right of the princes and states to make war and alliances among themselves or with foreigners was recognized.

The emperor died in 1657. His son Leopold I was elected emperor in 1658. The success of Louis XIV in his invasion of Holland led to a coalition against him, in which the emperor joined (1673). The war was continued for some years, and terminated by the Peace of Nimeguen, 1679. The League of Augsburg, in which the emperor joined, led to a protracted war with France, which was concluded by the Peace of Ryswick. In 1692 the emperor erected Hanover into an Electorate, and in 1700 he permitted the Elector of Brandenburg, Frederick III, to take the title of King of Prussia. The War of the Spanish Succession, in which Great Britain, Holland, and the empire were leagued against France, was begun in 1702. To it

belong the victories of Marlborough and Eugene (Blenheim, Oudenarde, Malplaquet). The Emperor Leopold died in 1705. He was succeeded by his son Joseph I, who died in 1711. Joseph was succeeded by his brother Charles VI. The alliance against France was dissolved by the Peace of Utrecht in 1713, to which the emperor refused to accede, and was left alone against France. After a brief campaign between Prince Eugene and Villars he acceded to the Treaty of Rastadt, negotiated between these commanders, 7th March, 1714. The Spanish Netherlands, and Naples, Milan, Sardinia, and other Italian conquests were left to the emperor. Having no male heirs, Charles had promulgated in 1713 the Pragmatic Sanction, regulating the succession to his hereditary dominions in favour of his daughters in preference to those of his brother Joseph I. He died in 1740. Charles Albert, Elector of Bavaria, son-in-law of Leopold I, got himself chosen emperor (as Charles VII) in 1742. He laid claim to the hereditary possessions of the House of Austria, and entered into an alliance with France, Spain, Prussia, &c., against Maria Theresa, daughter of Charles VI. But he died in 1745, and Francis I, Grand-Duke of Tuscany, the husband of Maria Theresa, was elected emperor; thus the House of Habsburg-Lorraine, which had succeeded to the hereditary possessions of Austria, was recognized as the head of the empire. After a brief interval took place the Seven Years' War (1756-1763), in which Austria, Russia, France, and Saxony combined against Prussia, then ruled by Frederick the Great. The Peace of Hubertsburg (15th Feb., 1763) concluded the war, Prussia retaining her acquisitions. In 1765 Joseph II succeeded to the imperial crown, becoming at the same time co-regent with his mother of the Austrian hereditary dominions. He joined with Russia and Prussia in the first partition of Poland (1772). He was succeeded by his brother Leopold, who, having died in 1792, was succeeded by his son Francis II. He joined in 1793 in the second partition of Poland. He took the command of his army against the French in 1794, concluded the Peace of Campo Formio with Bonaparte (17th Oct., 1797); joined the second coalition against France in 1799, and concluded the Treaty of Lunéville (3rd Feb., 1801); joined the



third coalition in 1805, and concluded the Treaty of Presburg (26th Dec., 1805). In 1804 Francis took the title of hereditary Emperor of Austria, renouncing two years later that of head of the German Empire, which, indeed, had ceased to exist, owing to the conquests of Napoleon.

The states of Germany were again united, by the Treaty of Vienna (1815), in the German Confederation (*der Deutsche Bund*). In 1818 a general commercial league, called the Zollverein, was projected by Prussia, and was gradually joined by most of the German states, exclusive of Austria. The German Diet was restored in 1851 by the efforts of Prussia and Austria, and in 1866 supported Austria in her dispute with Prussia respecting the disposal of the duchies of Schleswig and Holstein, whereupon Prussia withdrew from the Confederation and declared it dissolved. The Seven Weeks' War between Austria and Prussia ended in the defeat of the former, the loss of her Italian possessions, and her exclusion from the German Confederation, which was reformed by Prussia under the title of the North German Confederation. After the Franco-German War the King of Prussia was proclaimed German Emperor (William I) at Versailles in 1871. The war gave Alsace-Lorraine, large areas in Africa, and certain Pacific islands to Germany. William I was succeeded by his son Frederick, who reigned only ninety-nine days, and was succeeded by his son William II in 1888 (see *Prussia*).

During the reign of William II, Germany became a most efficient military, naval, and commercial power, but the Kaiser's policy aimed at the foundation of a world-empire and the downfall of Britain. In a European conflagration he saw an opportunity to realize his ambitions, and thus broke out the European War (q.v.). In 1918 a revolution took place, the Kaiser and the other German rulers abdicated, the empire disappeared, and a federation of republics came into being. Ebert was elected first President of the new German Federated Republic. In March, 1920, a *coup d'état*, manœuvred by Dr. Kapp, succeeded, but only for a few days. The Ebert Government managed to suppress the Communist and Spartacist risings. Ebert died in 1925, and was succeeded by Hindenburg. For Dawes Plan see *Ruhr*. See also *Locarno*. Germany became a

member of the League of Nations in 1926. In 1930 the National Socialists (Nazis) won many seats at the general election, and in 1933 the party secured control in Germany and their leader, Adolf Hitler, became Chancellor.—BIBLIOGRAPHY: J. E. Barker, *Modern Germany*; H. Oppenheimer, *The Constitution of the German Republic*.

*German Language*.—German is one of the Teutonic family of languages, of the Aryan or Indo-European stock, and hence is a sister tongue to Gothic, Old English and English, Dutch, Danish, Swedish, and Icelandic. The German dialects spoken in the lower and more northern localities have long exhibited considerable differences from those spoken in the higher and more inland, thus giving rise to the distinction between High German and Low German. What is ordinarily called German (called *Deutsch* by the Germans) is High German. Low German includes Dutch, Frisian, &c. Middle High German became literary in the twelfth century. During the following century Suabian was the predominant dialect. Ultimately Upper Saxon became the language of literature and cultivated society in consequence of the translation of the Bible by Luther, which may be said to have fixed the New High German of modern times.

*German Literature*.—Metrical translations of the Evangelists, the *Krist* and *Heliand*, appeared in the ninth century in the High and Low German dialects respectively. The *Merseburger Gedichte*, two songs of enchantment written in the tenth century, throw light on the ancient religious beliefs of Germany.

In the twelfth and thirteenth centuries poetry passed from the monasteries and ecclesiastical schools to the palaces of princes and the castles of nobles. Heinrich von Veldeke, who wrote an heroic poem *Eneit*, was the first of the *Minnesingers* (q.v.). A still greater name is that of Wolfram von Eschenbach, the author of *Parzival*, a poem embodying the legends of King Arthur. These traditions, together with the exploits of Charlemagne, of Alexander the Great, and the Trojan heroes, inspired also the lays of Gottfried of Strasbourg, Hartman von der Aue, and others. We have besides real national epics in the *Nibelungenlied* (q.v.) and *Gudrun*. Perhaps the most gifted lyricist is the celebrated Walther von der Vogelweide. Next to

him rank Heinrich von Ofterdingen, Reinmar der Alte, and the Austrian poets Nithard and Tannhäuser. In the thirteenth century didactic poetry began to be cultivated with some success. The dawn of historical literature is heralded by the *Limburg Chronicle* (1336-1398) and the *Alsace Chronicle* (1386). Various humbler poets formed themselves into guilds in the imperial cities—Nürnberg, Frankfurt, Strasbourg, Mainz, &c., and were called *Meistersänger*, in contradistinction to the knightly *Münnesänger*. The only good poetry in the fourteenth, and up to the close of the fifteenth century, were the spirited lays of Halb Suter and Veit Weber, who celebrated the victories of Switzerland over Austria and Burgundy. The invention of printing caused an increasing literary activity, and the works printed in Germany between 1470 and 1500 amounted to several thousand editions. In 1498 there was published the celebrated beast-epic *Reineke Vos* (Reynard the Fox). Other popular works were the *Narrenschiff* (Ship of Fools) of Sebastian Brandt and (in 1519) *Till Eulenspiegel*.

In the sixteenth century a new era opens in literature with Luther's translation of the Bible. The writings of Luther, Zwingli (1484-1531), Sebastian Frank (1500-1545?), Melancthon (1497-1560), Ulrich von Hutten (1488-1523), one of the chief writers of the *Epistolæ Obscurorum Vironum*, constitute the principal theological literature of the Reformation. History was now written with greater comprehensiveness, by Frank in the *Zeitbuch* and *Weltbuch*, and by Sebastian Münster (1489-1552) in his *Kosmographie*; also by Tschudi (1505-1572) in *Chronicles of Switzerland*, and by Aventinus (1477?-1534), the Bavarian chronicler. The autobiography of Götz von Berlichingen also deserves mention as a sketch of the rude lives of the smaller nobility. Amongst the poets of this period Hans Sachs (1494-1576), the cobbler of Nürnberg, the greatest of the *Meistersänger*, and Johann Fischart (died 1589) stand much above their contemporaries. The drama also made considerable progress, Hans Sachs, before mentioned, and Jakob Ayser (died 1605) being amongst the best writers in this department. Amongst the chief learned writers are Luther, Camerarius, Cornelius Agrippa, Paracelsus, Copernicus (astronomy), Leonhard Fuchs (botany and

medicine), Conrad Gesner (zoology and classics), and Agricola (mineralogy).

By the beginning of the seventeenth century literature was on the decline. This century is known in German literature as the period of imitation. A new school of poetry, known as the first Silesian school, was founded, of which Martin Opitz (1597-1639) was the leader. Amongst the chief members of the Silesian school were Simon Dach (1605-1669), von Zesen (1619-1689), Johann Rist (1607-1667), and, greatest of all, Paul Fleming (1609-1640). Of this school also was Andreas Gryphius (1616-1664), who may be said to have founded the regular German drama. The second Silesian school, headed by Hoffmann von Hoffmannswaldau (1618-1679) and Lohenstein (1635-1683), carried affectation to its utmost. Both the Silesian schools were opposed by the 'court poets', Canitz (1654-1699), Besser (1654-1729), and many others. Germany's greatest hymn writer, Gerhardt (1606-1676), belongs to this period. Among the scientific and philosophic writers of the period we may mention Kepler (1571-1631); Puffendorf (1632-1694), the publicist; and Jakob Böhme (1575-1624).

In the eighteenth century poetry revived with Haller (1708-1777) and Hagedorn (1708-1754). The Saxon school, headed by Gottsched (1700-1766), aimed at a reformation of German poetry on French lines, and brought about a violent controversy with a group of writers in Zürich, known as the Swiss school, and headed by Bodmer and Breitinger, who took the English poets as their model. With the writings of Klopstock (1724-1803) and Wieland (1733-1813) the classical period of German literature (usually reckoned from 1760) may be said to begin. But it was reserved for Gotthold Ephraim Lessing (1729-1781) to give a new direction to German literature. He established a new school of criticism and dealt a fatal blow to French influence. Herder (1744-1803) followed Lessing as another great influence in the literary world. The researches of Winckelmann (1717-1768) in ancient sculpture led to a new understanding of art, as those of Heyne in ancient literature mark the development of modern German scholarship. Amongst the Göttingen school were Gottfried Aug. Bürger (1748-1794), author of *Lenore* and

other wild and picturesque ballads and songs, and Voss (1751-1826), the translator of Homer, and author of one of the finest German idyls, *Luise*.

This period was followed by a time of transition and excitement known in Germany as the *Sturm-und-Drang Periode* (Storm and Stress Period), which found its fullest expression in an early work of Goethe's (q.v.) (1749-1832), the *Sorrows of Werther*. The literary excitement was raised to the highest pitch by the *Räuber* (Robbers) of Schiller (q.v.) (1759-1805), afterwards the friend and coadjutor of Goethe. Of a highly individual character are the works of Jean Paul Richter (1763-1825) and Jung Stilling (1740-1817). In the departments of science and philosophy, we have the names of Moses Mendelssohn (1729-1786); A. G. Baumgarten (1714-1762), the founder of the science of aesthetics; Adelung the philologist; Basedow and Pestalozzi the educationists; and the scientific writers Blumenbach, Euler, Vega, Herschel, and others. In the field of pure metaphysics Immanuel Kant was succeeded by Fichte (1762-1814), Hegel (1770-1831), and Schelling (1775-1854).

The Romantic school gradually succeeded in gaining public attention about this epoch. Amongst the principal writers of this school are von Hardenberg, better known as Novalis (1772-1801), Ludwig Tieck (1773-1853), La Motte Fouqué, Clemens Brentano, Hoffmann, Musæus, Werner, von Kleist, &c. The two Schlegels (August Wilhelm, 1767-1845, whose translation of Shakespeare is still celebrated, and Friedrich, 1772-1829) also belong to this school.

Amongst the patriotic poets of the time of the Napoleonic wars Ernst Moritz Arndt (1769-1860) and Theodor Körner (1791-1813) hold the first place. The ballads and metrical romances of Ludwig Uhland (1787-1872) and the lyrics of Friedrich Rückert (1789-1866) may also be mentioned. During the excitement produced by the July Revolution in France (1830) a school of writers arose in whose works the social and political ideas of the time were strongly reflected. The most prominent names amongst this party are Ludwig Börne (1786-1837) and Heinrich Heine (1799-1856), whose writings combine the keenest satire and the finest pathos. Amongst the better-known members of the school is Karl Gutzkow

(1811-1878), a popular dramatist and novelist. Among distinguished novelists are Freytag, Spielhagen, Heyse, Auerbach, Fanny Lewald, Hackländer, Reuter, Jensen, Storm, Rosegger, &c. In history, Niebuhr and Theod. Mommsen, the historians of Rome; Leopold Ranke, the historian of the Popes; and others may be mentioned. Biography has been well represented by Varnhagen von Ense, Pertz, David F. Strauss, and others. Baur, Bleek, and Ewald are among the widely-known names in theology. The brothers Grimm—Jakob (1785-1863) and Wilhelm (1786-1859)—were the founders of a new branch of philological and poetic investigation in ancient German literature. Eminent names in general philological science are those of Bopp, Pott, Schleicher, Steinthal, and Karl Brugmann. In natural sciences, Oken, Burmeister, Carus, Cotta, Liebig, Helmholtz, Virchow, Schleiden, Grisebach, Vogt, Bessel, Brehm, Häckel, Bastian, &c., are the eminent names; in philosophy, Schopenhauer, Feuerbach, Rosenkranz, Lotze, Kuno Fischer, von Hartmann, Nietzsche, &c.

Among the prominent novel writers belonging to the generation following the Franco-Prussian War are Ebers, Dahn, Gottschall, Wilbrandt, Paul Lindau, Baroness von Suttner, Anzengruber, Franzos, Sacher-Masoch, Clara Viebig, Thomas Mann, and others. The greatest modern German dramatists are Sudermann, Hauptmann, Halbe, Fulda, and Schnitzler. Among lyrical poets the most prominent are Liliencron, Dehmel, Busse, and Agnes Miegel. During the European War the literary activity of the German people, in spite of the stress of the war, was considerable. Separate articles will be found on the more important writers. — BIBLIOGRAPHY: J. G. Robertson, *History of German Literature*; G. M. Priest, *Brief History of German Literature*; C. Thomas, *History of German Literature*.

Germiston, the fourth largest town in the Transvaal, 9 miles from Johannesburg. It is in the centre of the gold-fields, and is an important railway junction. The Government gold refineries are at Germiston, and manufactures include chemicals, explosives, machinery, and tinned meat. Pop. (1921), 42,355 (white, 15,697); white pop. 1926, 16,545.

Germ Theory of Disease. This phrase came into use between 1860 and 1877, and

implied that certain diseases may result from the growth of bacteria in the body. The discovery that bacteria are the cause of putrefaction, and the success attending Lister's efforts to prevent blood-poisoning by excluding bacteria from surgical wounds, form the historical setting of the theory. The first absolute proof of its reliability was furnished when, in 1877, Koch showed that the bacillus anthracis was the cause of anthrax in cattle. Since 1877 evidence has been adduced for bacteria being the cause of the following diseases, each disease being associated with a special bacterium: inflammation and abscess formations (1881-1884), erysipelas (1884), pneumonia (1886), epidemic cerebro-spinal meningitis (spotted fever) (1887), tuberculosis (1882), glanders (1882), typhoid fever (1880-1884), bacillary dysentery (1898), diphtheria (1883-1890), tetanus (1885-1889), cholera (1884-1893), plague (1894), and syphilis (1905).

Bacteria either multiply on some bodily surface and produce poisons which are absorbed (diphtheria), or they penetrate into the body and settle down in an organ for which they have a predilection (typhoid fever, pneumonia), from which they exercise their disease effects. The body resists their inroads; certain cells rush to the part and engulf and destroy the organisms, and a general mechanism throws substances into the blood which kill the bacteria or neutralize their effects (see *Antitoxin*). Exposure to infection is not invariably followed by disease. The part played by the constitution of the person exposed is most important.

The failure of bacteriology to account for the cause of malaria led to an important development of the germ theory, whereby it was shown that the protozoa—a much more highly organized group than the bacteria—could act as the agents of infection. Malaria was proved to be due to such a cause.

Gérôme, Jean Léon (1824-1904), French painter. In 1855 a large canvas, *The Age of Augustus and the Birth of Christ*, was purchased by the State, and was the first of a series of works on classical themes, including *Cæsar* (1859), *Phryne* (1861), *Le Roi Candaule* (1861), and *Socrates* (1861). Among his historical pictures is *Louis XIV and Molière*; and he was also a successful sculptor.

Gerona, a fortified town of North-East

Spain, capital of the province of Gerona, in Catalonia. There is spinning and weaving; also paper factories. Pop. 17,416.—*Gerona*, the province, has an area of 2264 sq. miles and a population of 330,192. It is mountainous, but there are many fertile valleys producing olives, wine, wheat, and all kinds of fruits and vegetables.

Gers, a department in the south-west of France; area, 2428 sq. miles. The southern part is covered with ramifications of the Pyrenees separated by valleys, each of which is watered by its own stream. The chief of these are the Gers, Losse, and Save. More than half the land is under the plough, and about a seventh is in vineyards. Much of the wine is made into Armagnac brandy. Auch is the capital. Pop. (1926), 196,419.

Gerson, Jean de, properly Jean Chailier (1363-1429), French theologian. He is mainly remembered in connexion with his efforts to bring about a cessation of the great schism which had divided the Church since 1378. His proposal was to depose both the rival Popes and elect a third in their room. This proceeding, however, was a failure, the only result being that there were three rival Popes instead of two (1409). Gerson spent the last ten years of his life with his brother, the prior of a community of Celestine monks at Lyons, living an ascetic life, and devoting himself to religious meditation and the composition of theological and other treatises.

Gervase of Canterbury (1150-1210), English chronicler. Amongst his writings is an important chronicle, *Chronica de tempore regum Angliæ, Stephani, Henrici II et Ricardi I*. He also wrote *Gesta Regum*, and *Mappa Mundi*, a survey of the counties of England.

Gervase of Tilbury (d. 1218), English chronicler. He taught law at Bologna for a time, and was in the service of the Emperor Otto IV. His chief and only extant work is entitled *Otia Imperialia*. Its contents are of a very varied character, including facts pertaining to geography, natural history, and superstitions, besides an account of the history of Britain and of the English kings down to his own time.

Gervex, Henri (1852-1913), French painter. Among his works are: *Satyr playing with Bacchante* (1874), *Diana and*



*Endymion* (1875), *Return from the Ball* (1879), *Civil Marriage* (1881), *First Communion* (1884), *Meeting of the Jury on Painting* (1885), *The Coronation of Nicholas II* (1896), *The Mayors' Banquet* (1900), &c.

**Gervinus**, Georg Gottfried (1805–1871), German critic and historian. After a visit to Italy he published his *Geschichte der Poetischen Nationalliteratur der Deutschen* (History of the Poetic National Literature of the Germans, 1835–1842). In 1849 he published the first part of his large work on Shakespeare, in 1853 his *History of German Poetry*, and in 1855 the first volume of his *History of the Nineteenth Century*, which, however, was never carried further than the French Revolution of 1830. Amongst his last writings was a critical essay, *Handel and Shakespeare*.

**Gesner**, Konrad von (1516–1565), German-Swiss naturalist. His *Historia Animalium* must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers. His *Bibliotheca Universalis* is a descriptive catalogue of all writers extant in Greek, Latin, and Hebrew.

**Gesta Romanorum** ('Deeds of the Romans'), the usual title of a collection of short tales, legends, &c., in Latin, very popular during the Middle Ages. The book was probably written about the close of the thirteenth century by a certain monk Elinandus, an Englishman or a German. The stories were very widely read and gave plots (directly or indirectly) to Gower, Chaucer, and Shakespeare.

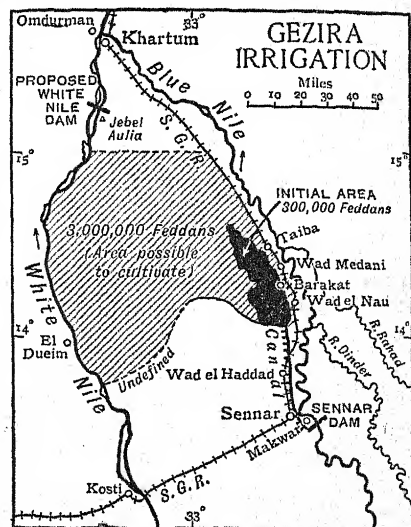
**Gethsemane**, an olive garden or orchard in the neighbourhood of Jerusalem, memorable as the scene of the last sufferings of our Lord. The traditional site of this garden lies towards the east side of the city, a very little beyond the Kedron, near the base of Mount Olivet.

**Geum**, a genus of hardy herbaceous perennials, belonging to the nat. ord. Rosaceæ, of which two, *G. urbanum*, wood-avens, and *G. rivale*, water-avens, are found in Britain.

**Geysers**, explosive springs of hot water, first observed in Iceland. The geysers of Iceland, about a hundred in number, lie in a plain about 30 miles north-west of Mount Hecla. The most remarkable is the Great Geyser, which throws up at

times a column of hot water to the height of from 80 to 200 feet. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone Region of Wyoming, the largest of which throw up jets of water from 90 to 250 feet high. The hot-lake district of Auckland, New Zealand, also possesses some remarkable geyser scenery. Ngahapu or Ohopia, a circular rocky basin, 40 feet in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 feet, emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere.

**Gezira**, a great plain in the Anglo-Egyptian Sudan, lying south of Khartoum



and bounded by the White Nile and the Blue Nile. The area is approximately 10,000,000 acres, of which 3,000,000 are capable of growing cotton of high quality. In view of this, work was started in 1920 in connexion with an immense irrigation scheme which contemplated the bringing under cultivation of 300,000 acres stretching along the Blue Nile. The main parts of this scheme were the Sennar dam at Makwar, a main canal 62 miles long, and about 900 miles of subsidiary and field canals. The storage reservoir extends for 58 miles from Makwar to Singa, and has a capacity

of 22,896,000 cubic feet. The actual dam (built of granite) is 2 miles long, and is one of the greatest engineering constructions in the world. It was opened in 1926. The irrigation area was originally limited to 300,000 acres, because of the fixed but erroneous belief of the Egyptians that the irrigation of a wider district would prevent a sufficiency of water reaching the irrigated lands in Egypt. Provision was, however, made for future extension to 1,000,000 acres, and after the murder of the Sirdar (Sir Lee Stack) in 1924 the Egyptian authorities were informed that the Sudan Government would, if necessary, increase the Gezira irrigation area to an unlimited extent. See *Egypt*.

**Ghadames**, a town of North Africa, in the south-west of Tripoli. It is situated in the midst of an oasis, and is the centre of caravan routes to Tunis, Tripoli, &c. Figs, dates, barley, and wheat are grown in the gardens, which are watered by a hot spring. Pop. about 10,000.

**Ghara**, a river in the Punjab, being the name by which the united streams of the Bias and Sutlej are known from their confluence at Endrisa to the junction with the Chenab.

**Gharbujah**, a maritime province of Lower Egypt. Area, 2534 sq. miles; pop. 1,659,313.

**Ghardaia**, a town and oasis of Algeria, in the Sahara, on an important trade route. Pop. of oasis, 38,000; of town, 8000.—The territory of *Ghardaia* has a population of 145,029.

**Ghat**, a village and oasis in Italian Libya. It is a caravan halting-place on the route from Tripoli to the West Sudan.

**Ghats**, Eastern and Western, two ranges of mountains in the peninsular portion of India, the former running down the east side of India, but leaving broad tracts between their base and the coast; the latter running down the west side, but leaving only a narrow strip between them and the shore. Both meet near Cape Comorin. The Western Ghats form a watershed, and the rain collected on its eastern slopes makes its way right across India to the Bay of Bengal. They are covered with fine forests. The Eastern Ghats are rich in metals.

**Ghaziabad**, a town, United Provinces, India, on the trunk road from Calcutta to Peshawar, and an important railway junction. Pop. 10,000.

**Ghazipur**, a town in India, headquarters of the Ghazipur District, in the United Provinces. It stretches along the banks of the Ganges, and has a trade in sugar, tobacco, rosewater, and attar of roses. Pop. 40,000.—The district has an area of 1473 sq. miles and a pop. of 1,077,909.

**Ghazna**, an ancient city and fortress in Afghanistan, 84 miles s.s.w. of Kabul. The country round Ghazna is very productive in grain, fruits, and tobacco.

**Gheel**, a village and commune in Belgium, 26 miles e.s.e. of the city of Antwerp. It has manufactures of cloth, hats, wax and tallow candles; tanneries, dye-works, ropeworks, and a considerable trade in butter. The commune has long been remarkable for containing a colony of insane persons, who are lodged and boarded in the houses of the country people, who make use of their services, when available, in field and other labour. Pop. 13,470.

**Ghent**, a city in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Schelde. It has a cathedral, some fine churches, and a university founded in 1816. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Other industries of importance are sugar-refining, and the making of hosiery, thread, ribbons, instruments of steel, carriages, paper, hats, delft-ware, and tobacco. There are also machine-works, engine-factories, roperies, tanneries, breweries, and distilleries. Ghent is famous for its nurseries and flower traffic. The general trade is large. A canal (minimum width at water-level, 220 feet) that admits large sea-going vessels drawing up to 26 feet 2 inches connects the town with the Schelde at Terneuzen. Navigation on this canal is free. Another canal connects the Lys with the canal from Bruges to Ostend. Ghent harbour provides accommodation for the largest vessels which can enter the sea canal, and has two good dry-docks. Pop. 164,373. Ghent is mentioned as a town in the seventh century. In the ninth century Baldwin, the first Count of Flanders, built a fortress there to check the Normans. Under the Counts of Flanders Ghent continued to increase, and the wealth and liberty of its citizens disposed them to a bold maintenance of their privileges

against the encroachments of feudal lords like the Dukes of Burgundy and the Kings of Spain. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the department of Escaut (Schelde). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland.

Gherba, an island in the Gulf of Qabes, North Africa, belonging to France.

Ghetto, a name used in different towns of Italy, Germany, and other countries to indicate the quarter set apart for the residence of Jews. The first Ghetto was that of Rome, in the time of Pope Paul IV, who compelled the Jews to dwell in a quarter set apart for them on the left bank of the Tiber.

Ghibellines. See *Guelfs and Ghibellines*.

Ghiberti, Lorenzo (1378-1455), Italian sculptor. He was engaged in painting frescoes at Rimini when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistery of San Giovanni, and the model of Ghiberti was selected as the best. After twenty-one years' labour Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michelangelo said of these, that they were worthy of adorning the entrance to Paradise.

Ghilan, a province of Persia, on the south-west shore of the Caspian Sea; area, about 5000 sq. miles. The lofty range of the Elburz Mountains forms its southern boundary. Practically the whole province is covered with woods. The capital is Resht. Pop. about 150,000.

Ghirlandaio, or Corradi.—(1) Domenico (1449-1494), Florentine painter. Important frescoes by him are in the Sistine Chapel at Rome and in S. Trinità and S. Maria Novella at Florence, where also he is well represented in the Uffizi and the Academy. He was fond of introducing contemporary portraits into his work.—(2) Ridolfo (1483-1560), son of Domenico, strongly influenced by Raphael, one of the most popular Florentine painters of the day, who, in addition to portraits and decorations for churches, produced many large scenic canvases for public festivals.

Ghorbana Valley, a coal-producing area of Afghanistan.

Ghur, a mountainous district of Afghanistan, lying to the south of Herat.

Gianibelli, or Giambelli, Federico (? b. 1530), Italian military engineer. After having offered his services to Philip II of Spain, who received him coldly, he went to England, where Elizabeth gave him a pension. He fortified the coast-line against the Spanish invasion, and suggested the use of fire-ships, which was so disastrous to the Armada.

Giannone, Pietro (1676-1748), Italian author. In 1723 he published his great work the *Storia civile del regno di Napoli*. As this book attacked the temporal power of the Pope, it was burned, and the author excommunicated. After living in Vienna and Venice, Giannone finally took refuge in Geneva. Here he wrote his *Il Triregno*, a bitter attack on the Papal pretensions. In 1736, having been enticed by a Government emissary to enter the Sardinian states, he was seized and imprisoned in the citadel of Turin, where he died.

Giants. The ordinary height of men is between 5 and 6 feet; amongst the Patagonians of South America, however, the average seems to be considerably higher, though they are not a race of giants. Notable deviations from the medium heights are not at all uncommon, especially among the Teutonic peoples. The following are amongst recorded instances, ancient and modern, of persons who attained to the stature of giants: the Roman Emperor Maximin, a Thracian, nearly 9 feet high; Queen Elizabeth's Flemish porter, 7 feet 6 inches; C. Byrne, who died in 1783, attained the height of 8 feet 4 inches; Patrick Cotter O'Brien, who lived about the same time, was 8 feet 7½ inches; a Swede in the celebrated grenadier guard of Frederick William I of Prussia stood 8½ feet; in 1884 died Pauline Wedde (called Marian), over 8 feet 2 inches at the age of eighteen; Anna Swan, a native of Nova Scotia, was more than 8 feet high; her husband, Captain Bates (died 1919), a native of Kentucky, was the same height; Chang-wu-gon, the Chinese giant, was 7 feet 9 inches high. As a rule giants are comparatively feeble in body and mind, and are short-lived. Recent research in clinical medicine has revealed the fact that most of these cases of 'giantism' are pathological, disease of the pituitary gland giving rise to a condition known as acro-

megaly.—Cf. E. J. Wood, *Giants and Dwarfs*.

**Giant's Causeway**, a promontory of columnar basalt on the north coast of Ireland, in the county of Antrim, between Bengore Head and Portrush. The Grand Causeway is from 20 to 30 feet wide, and stretches some 900 feet into the sea. Its basaltic columns are from 15 to 36 feet in height. The Giant's Causeway derives its name from the legend that it was built by Finn MacCoul. There are similar formations on the west coast of Scotland, on the Island of Staffa.

**Giarre**, a town of Sicily, province of Catania, on the slope of Mount Etna. It is celebrated for its wine, which it exports from the port of Riposto. Pop. 22,000.

**Gibbon**, Edward (1737–1794), English historian. His first work, which he wrote in French, was his *Essai sur l'étude de la littérature* (1761). In 1763 he visited Paris and Lausanne, and during 1764 he journeyed in Italy. It was here that the idea of writing his great history occurred to him as he sat musing among the ruins of the capitol at Rome, while the barefooted friars were singing vespers in the Temple of Jupiter. In 1776 the first quarto volume of his *Decline and Fall of the Roman Empire* was published. The next two volumes appeared in 1781. In 1783 he withdrew to Lausanne, where, in the course of four years, he completed the three remaining volumes of his history, which were published together in 1788. Gibbon's history, though not without its defects, has great merits. Its style, if at times somewhat monotonous, has the energy and elevation required for so great a theme; his learning is vast and thorough, and his insight into human nature in every variety of circumstances in remote countries and epochs is that of a great and philosophical historian.—Cf. J. A. C. Morison, *Gibbon* (in English Men of Letters Series).

**Gibbon**, a name common to the apes of the genus *Hylobates*, but more particularly applied to the species *Hylobates lar*, which inhabits the islands of the Indian Archipelago. It is distinguished by the slenderness of its form and the extraordinary length of its arms. Its colour is black, but often it has a white or grey beard.

**Gibbons**, Grinling (1648–1721), English wood-carver and sculptor of Dutch

origin. He was employed by royalty, and by most of the nobility of his time, to execute carvings in their houses and for churches.

**Gibbons**, Orlando (1583–1625), English musical composer. At the age of twenty-one he was appointed organist of the Chapel Royal. He is the author of madrigals and anthems (*Hosanna to the Son of David! Almighty and Everlasting God!*) and other works.

**Gibeon**, a town in South-West Africa, the centre of an agricultural district. It is near the railway running to Walvis Bay. Pop. 5000 (1300 white).

**Gibraltar**, a town and strongly-fortified rocky peninsula near the southern extremity of Spain, constituting a British Crown Colony. It is connected with the mainland by a low sandy isthmus,  $1\frac{1}{2}$  miles long and  $\frac{1}{2}$  mile broad, known as the 'neutral ground', and has Gibraltar Bay on the west, the open sea on the east



White-handed Gibbon (*Hylobates lar*)

and south. The highest point of the rock is about 1400 feet above sea-level; its north face is almost perpendicular, while its east side exhibits tremendous precipices. On its south side it is almost



inaccessible, making approach from seaward impossible; the west side, again, although very rugged and precipitous, slopes towards the sea; and here the rock is secured by extensive and powerful batteries, rendering it apparently impregnable. Vast sums of money and an immense amount of labour have been spent in fortifying this celebrated stronghold, which, as a coaling-station, depot for war material, and a port of refuge in case of war, forms one of the most important points of support for British naval operations and British commerce eastwards. Numerous caverns and galleries, extending 2 to 3 miles in length, and of sufficient width for carriages, have been cut in the solid rock, with port-holes at intervals of every 12 yards bearing upon the neutral ground and the bay, and mounted with more than 1000 guns, some of them of the largest size. The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus fronts the bay. It consists chiefly of one spacious street about  $\frac{1}{2}$  mile in length. Its water-supply is derived from the rainfall. Gibraltar is a free port, but there is a duty on malt liquors, wine, spirits, and tobacco. It has a considerable shipping trade, being an entrepôt for the distribution of British manufactures in Northern Africa. The chief export is wine. The administration is vested in the Governor, who is also commander-in-chief of the troops. The harbour has a water area of 440 acres, including the naval harbour on the west side of the rock. There are three Government graving-docks and all facilities for shipping coal and oil fuel. Pop. about 22,000, including 3500 naval and military and 1700 aliens. The colony is self-supporting. Gibraltar, known to the Greeks as Calpe, was first fortified as a strategic point by the Saracen leader Tarik Ibn Zeiad in 711-712, from whom it was thenceforward called Gebel-al-Tarik, the rock of Tarik. It was ultimately taken by the Spaniards from the Moors in 1462, and fortified in the European style. It was taken after a vigorous bombardment in 1704 by a combined English and Dutch force under Sir George Rooke and Prince George of Darmstadt, and was secured to Britain by the Peace of Utrecht in 1713. Since then it has remained in British hands, notwithstanding some desperate efforts on

the part of Spain and France to retake it. In 1779 a last grand effort was made by Spain to recover Gibraltar, and the siege lasted four years. The Rock was, however, successfully defended by General Eliot (afterwards Lord Heathfield).—BIBLIOGRAPHY: *Gibraltar Directory and Guide Book*; A. Macmillan, *Malta and Gibraltar*.

**Gibraltar, Straits of**, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and  $8\frac{1}{2}$  miles across.

**Gibson, John** (1790-1866), English sculptor. Amongst his best works are: *The Wounded Amazon*, *The Hunter and his Dog*, *Hylas surprised by Nymphs* (in the National Gallery), *Helen*, *Proserpine*, and *Sappho*.

**Giers, Nicholas Carlovitch de** (1820-1895), Russian statesman. After holding various posts, in 1875 he became assistant to Prince Gortschakov, the Minister of Foreign Affairs, whom he succeeded in 1882. His policy in general was of a peaceful tendency, and in particular opposed to Pan Slavistic ideas of development.

**Giessen**, a town of Germany, Republic of Hesse. It has a castle, now converted into Government offices, and a university founded in 1607. There are iron-foundries and chemical-works. Pop. (1925), 33,600.

**Giffen, Sir Robert** (1837-1910), British statistician and financial writer. In 1876 he was appointed chief of the Statistical Department of the Board of Trade, and eventually became Controller-General of the Commercial, Labour, and Statistical Departments, retiring in 1897. His publications include: *Stock Exchange Securities* (1878), *Essays on Finance* (1879 and 1880), *Trade Depression and Low Prices* (1885), *The Growth of Capital* (1890), *The Case against Bimetallism* (1892), and *Economic Enquiries and Studies* (1904).

**Gifford, William** (1757-1826), British critic and satirist. He published in 1794 *The Baviad*, a satire directed against the poetasters of the Della Crusca school; and in 1795 *The Mæviad*, a severe satire on the contemporary drama. On the foundation of the *Quarterly Review* in 1809 he became its editor. He also edited the works of Massinger, Ford, Jonson, and Shirley.

**Gifford Lectures**, lectureships endowed by Lord Gifford, one of the judges

of the Court of Session, Edinburgh, from 1870 to 1881, who left £80,000 for the purpose. They were founded in connexion with the Universities of St. Andrews, Glasgow, Aberdeen, and Edinburgh, and are for the exposition of natural religion in the widest sense of that term.

**Gifu**, a town of Japan, Island of Honshu. Pop. 62,713.

**Gijón**, a seaport in Spain, on the Bay of Biscay. It contains a cigar manufactory, and has various other industries and a good trade. The harbour accommodates vessels drawing 17 feet 6 inches alongside the quays. The chief exports are nuts, butter, cheese, minerals, and liqueurs. Pop. 57,573.

**Gila**, Rio, a North American river, which rises in New Mexico, flows westward for 450 miles, and unites with the Colorado.

**Gilbert, Sir Humphrey** (c. 1539–1583), English navigator. In 1578 he obtained from the queen a patent, empowering him to explore and colonize in North America any land then unsettled, and made an unsuccessful voyage to Newfoundland. In 1583 he sailed to it again, and took possession of the harbour of St. John's. Shortly after he embarked in a small sloop to explore the coast, and was lost in a storm.

**Gilbert, Sir John** (1817–1897), English painter. The first picture he exhibited (in 1836) was *The Arrest of Lord Hastings*, in water-colour, which medium he used constantly all his life. He also painted in oil, and among his more notable productions therein are: *Don Quixote giving Advice to Sancho Panza*, *The Education of Gil Blas*, and a series of tableaux of the principal characters in Shakespeare.

**Gilbert, Sir William Schwenck** (1836–1911), English dramatist. He was educated at the Western Grammar School, Brompton, the Great Ealing School, and King's College, London. After four years in the Civil Service, he read for the Bar, and was called in 1863. Meanwhile he was supporting himself by means of journalism, writing for *Fun*, a comic paper then edited by H. J. Byron. To this paper he contributed the famous series of comic poems known as *The Bob Ballads*. Gilbert was a talented illustrator, and drew admirable illustrations for these ballads. He commenced his career as a dramatist in 1866 with a burlesque on *L'Élixir d'Amore* entitled *Dulcamara, or The Little Duck*

and *the Great Quack*. This was followed by several other burlesques, including *La Vivandière* and *Robert the Devil*. He then tried his hand at blank-verse plays, and wrote *The Palace of Truth* (1870), *The Wicked World* (1873), and *Pygmalion and Galatea* (1871). *Charity*, a serious play, was produced in 1874, and enjoyed only a moderate success. *Sweethearts*, a pleasantly sentimental dramatic contrast, appeared in the same year. *Dan'l Druce* was produced in 1876, and *Engaged*, a cynical farce based upon the Scottish marriage laws, in 1877.

In 1871 Gilbert was introduced to Sullivan, and the immediate result was a comic opera, *Thespis*, or *The Gods Grow Old*. In 1875 they collaborated in *Trial by Jury*, a dramatic cantata of exquisite finish, satirizing the procedure in a breach-of-promise case. The great series of operas, however, may be said to have begun with *The Sorcerer* in 1877. The others are: *H.M.S. Pinafore*, or *The Lass that Loved a Sailor* (1878); *The Pirates of Penzance*, or *The Slave of Duty* (1880); *Patience*, or *Bunthorne's Bride* (1881); *Iolanthe*, or *The Peer and the Peri* (1882); *Princess Ida*, or *Castle Adamant* (1884); *The Mikado*, or *The Town of Titipu* (1885); *Ruddigore*, or *The Witch's Curse* (1887); *The Yeomen of the Guard*, or *The Merryman and his Maid* (1888); *The Gondoliers*, or *The King of Barataria* (1889); *Utopia Limited*, or *The Flowers of Progress* (1893); and *The Grand Duke*, or *The Statutory Duel* (1896). A more perfect partnership than that of Gilbert and Sullivan never existed, and the Savoy operas are unique in every way. Indeed, they may all be said to be virtually flawless, and none of them has strong claims to pre-eminence over the others. Gilbert wrote one or two libretti for other composers. Alfred Cellier wrote the music of *The Mountebanks* (1892), and Dr. Osmond Carr that of *His Excellency* (1894). Edward German composed the score of *Fallen Fairies* (1900), an operatic version of *The Wicked World*. Gilbert's last play was a realistic sketch called *The Hooligan* (1911).

Gilbert had no predecessors in opera-writing; he invented his own methods and left no successor. He was a highly original genius, and left the mark of his originality on everything he wrote. He was a master of stage-craft, and thought no trouble too great to take to secure the effect he

desired. Probably no dramatist ever had his own intentions so exactly carried out, as he was his own stage manager, and something of a martinet at rehearsals. In all his work there is literary grace and finish, and a logical absurdity to which the epithet 'Gilbertian' is applied.—**BIBLIOGRAPHY:** E. A. Browne, *W. S. Gilbert*; Sidney Dark and Rowland Grey, *W. S. Gilbert: Life and Letters*; S. J. Adair Fitz-Gerald, *The Story of the Savoy Opera*; A. H. Godwin, *Gilbert and Sullivan*.

**Gilbert Islands**, or **Kingsmill Group**, a group of sixteen islands in the Pacific Ocean, cut by the equator. The area is 166 sq. miles, and the population about 30,400 (400 foreigners).—*The Gilbert and Ellice Islands Colony* comprises the Gilbert Islands, the Ellice Islands, the Union (Tokelau) Group, and Fanning, Washington, Ocean, and Christmas Islands (all of which see). Most of the islands in this group were proclaimed a British protectorate in 1892, and (at the request of the natives) annexed as a colony in 1915. Ocean Island is the administrative centre and the seat of the Resident Commissioner. They are of coral formation, low and not fertile. Their chief products are the coconut, pandanus, taro, and the bread-fruit tree.

**Gilboa**, a range of hills in Palestine, bounding the Plain of Esdraëlon on the north-east.

**Gildas the Wise** (c. 516–570), a British ecclesiastic and historian. There is extant a Latin treatise or diatribe ascribed to Gildas which bears the title of *Epistola de Excidio Britannie* (on the Destruction of Britain).

**Gilding** as an art was extensively practised among the ancients. Present-day processes are very varied. Metals are gilded either by what is called chemical gilding, mercurial gilding, by electro-gilding, or by the application of gold-leaf. Gilding on wood, plaster, leather, parchment, or paper is performed by different processes of mechanical gilding. In the case of paper or vellum the parts to be gilt receive a coat of gum-water or fine size, and the gold-leaf is applied before the parts are dry. Lettering and other gilding on bound books is applied without size. The gold-leaf is laid on the leather and imprinted with hot brass types. Frames of pictures and mirrors, mouldings, &c., are gilt by the application of gold-leaf,

or by the cheaper process of 'German gilding', that is, by tin-foil or silver-leaf, with a yellow varnish above. Porcelain and other kinds of earthenware, as well as glass, may be gilt by fixing a layer of gold in a powdered state by the action of fire.

**Giles, St. (St. Ægidius)** (sixth century A.D.), Greek abbot. He is said to have worked miracles, and founded a convent in France. He became patron saint of Edinburgh.

**Gillfillan**, George (1813–1878), Scottish author. His works include: *A Gallery of Literary Portraits*, *The Bards of the Bible*, and *The Martyrs of the Covenant*.

**Gilgit**, a valley and district in Kashmir state, situated on the southern slopes of the Hindu Kush, and watered by the Gilgit, a tributary of the Indus.

**Gill, Sir David** (1843–1914), British astronomer. He was educated at Aberdeen University. In 1879 he was appointed Astronomer Royal at the Cape of Good Hope, a post which he held till 1907. He was created a K.C.B. in 1900. His numerous publications include works on *Heliumeter Determinations of Solar and Stellar Parallax*; the *Cape Photographic Durchmusterung*; and *History and Description of the Royal Observatory, Cape of Good Hope*.

**Gillingham**, a borough of Kent, north-east of Chatham, on the Medway, which is navigable there. A quantity of fruit is grown in the neighbourhood. Pop. (1931), 60,983.

**Gillray, James** (1757–1815), English caricaturist. He achieved a European reputation by a succession of caricatures, numbering about 1200 and marked by great technical mastery, in which the king (George III) and the members of the House of Lords, and afterwards the French and the French celebrities of the day, were the chief objects of ridicule.

**Gillyflower**, a name bestowed on such cruciferous flowers as the wall-flower or carnation, &c. The clove-pink (*Dianthus Caryophyllus*) is termed clove gillyflower.

**Gilmour, Sir John** (1876– ), British politician. In 1924 he became Secretary for Scotland, and was Secretary of State for Scotland, 1928–29. He became Minister of Agriculture in 1931.

**Gilolo**, an island in the East Indian Archipelago, the largest of the Moluccas; area, 6950 sq. miles. It is rugged and

mountainous, the mountains being volcanic. The principal products are sago, coco-nuts, spices, fruits, edible birds'-nests, and timber. The original inhabitants, called Alfuros, have been gradually pressed into the interior by the Malays. The island, included in the Residency of Ternate, belongs to the Netherlands. Pop. about 120,000.

**Gilthead** (*Chrysophrys auratus*), a spiny-finned fish of the Sparidae or sea-bream family, common in the Mediterranean. Its colour is a mixture of silver and sky-blue. It sometimes reaches a weight of 18 to 20 lb. The gilthead was a popular dainty with the Romans.

**Gimbals.** See *Compass*.

**Gin.** See *Wines and Spirits*.

**Ginger** (*Zingiber officinale*), an East Indian plant of the order Zingiberaceæ,



Ginger (*Zingiber officinale*)

Root, flower, and foliage

found in tropical Asia, the Asiatic islands, the West Indies, South America, and West Africa. The best kind comes from Jamaica. The rhizome or underground stem is used in a variety of ways; when young it is candied and makes an excellent preserve. It is also used in confectionery and in medicine.

**Ginkgo**, a genus of Gymnosperms, comprising the single species *Ginkgo biloba*, the

maidenhair tree, the sole living type of the ancient class Ginkgoales. It is a handsome, hardy, deciduous tree, and is a native of China and Japan.

**Ginsburg**, Christian David (1831–1914), rabbinical scholar. He is the author of *The Essenes; The Kabbalah: its Doctrines, Development, and Literature*, and other works of similar character. His greatest work is, however, the *Massorah*.

**Ginseng**, a plant of Northern Asia, *Panax ginseng*, order Araliaceæ, herbaceous, and about 1 foot high. Its root is regarded as a sort of panacea among the Chinese.

**Gioja Del Colle**, a town in Southern Italy, province of Bari, on a slope of the Apennines. Pop. (commune), 21,837.

**Giolitti**, Giovanni (1842–1928), Italian statesman. He became Minister of Finance in 1889 in the Crispi Cabinet, and Premier and Minister of the Interior in 1892. He was again Prime Minister from 1903 to 1905, from 1906 to 1909, from 1911 to 1914, and from 1920 to 1921.

**Giordano**, Luca (1632–1705), Italian painter. After working in Naples and Florence, in 1692 he was employed by Charles II to decorate the Escorial, and at the court of Spain he became a great favourite. After the death of Charles II he was retained in the service of Philip V, but eventually returned to his native country. His best-known works are his frescoes in the Escorial, and paintings at Madrid, Florence, and Rome. Among his best works are: *Venus and Mars* in the Louvre, and *The Judgment of Paris* in Berlin.

**Giorgione**, properly *Giorgio Barbarelli* (1477–1511), Italian painter. In Venice he ornamented the façades of several large buildings with frescoes, which have mostly perished. His portraits are among the finest of the Italian school. His works are rare, but good examples may be seen at Milan, Castelfranco, and in the galleries at Florence, Venice, Vienna, and Dresden. He is also represented in the National Gallery (*Golden Age*) and at Hampton Court (*Shepherd*).

**Giotto**, properly *Ambrogio* or *Angiolotto Bondone* (1266–1337), Florentine painter. The strong naturalism which marks his work was a complete break with older traditions, and definitely changed the whole course of European painting. Among his most important work are frescoes at Rome, at Assisi,

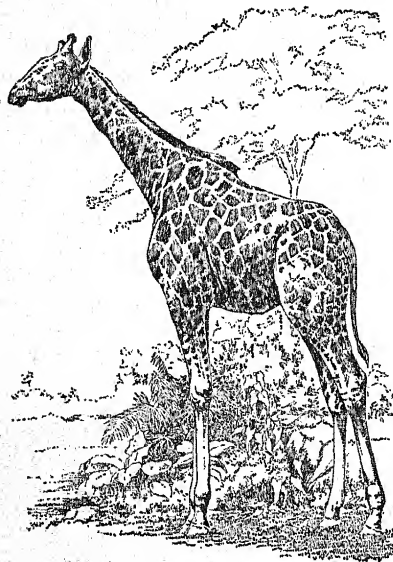


in the Arena Chapel at Padua, and in S. Croce at Florence. He was also a remarkable architect, the campanile of the Cathedral of Florence being his work.

**Gippsland**, the south-easternmost district of the Australian state of Victoria. Area, 13,898 sq. miles.

**Gippsland Lakes**. See *Victoria*.

**Giraffe**, or **Camelopard** (*Giraffa*), a ruminant animal inhabiting Africa, and



Giraffe (*Giraffa australis*)

the type of a small family also including the Okapi (q.v.). It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 feet. It has three little excrescences on the head, like horns, but permanently covered with skin. Giraffes are usually of a light fawn marked with dark spots, and are mild and inoffensive animals. The giraffe is a native of a great part of Africa, from the latitude of Abyssinia southward to the Transvaal and the Kalahari Desert. There are two distinct species, one (*G. camelopardalis*) native to Somaliland, and the other (*G. australis*) to South Africa. The third horn is much better developed in the latter.

**Giraldus Cambrensis** (1146-1220), Welsh historian. His proper name was

Gerald de Barry, and he was the son of William de Barry, a Norman noble of Pembrokeshire. As companion to the king's son, Prince John, he went to Ireland in 1185, where he collected the materials for his *Topographia Hibernica*. He afterwards drew up a similar work on Wales (*Itinerarium Cambrie*).

**Girardin**, Émile de (1802-1881), French journalist and politician. He was connected as projector, editor, or otherwise with a number of newspapers and periodicals, the most successful being *La Presse*, a Conservative organ established in 1836. In politics Girardin played many parts.—His first wife, Delphine Gay (1804-1855), daughter of the novelist Madame Sophie Gay, was a well-known authoress. She wrote the novels *La Canne de M. de Balzac*, *Il ne faut pas jouer avec la douleur*, and *Marguerite*.

**Girasol**, a precious opaline stone, a variety of which is the fire opal. The name is sometimes given to the Asteria sapphire.

**Girdle of Venus** (*Cestum Veneris*), a ribbon-like phosphorescent animal about 3 feet long, found in the Mediterranean and Atlantic.

**Girga**, a town of Upper Egypt, on the left bank of the Nile. Pop. 19,893.—The province of *Girga* has an area of 609 sq. miles; pop. (1927), 968,383.

**Girgenti**, a town in the south-west of Sicily, capital of the province of same name, with a cathedral dating from the fifteenth century. It exports wheat, oil, fruit, and sulphur, its port being Porto Empedocle. Pop. 29,323.—The province has an area of 1175 sq. miles and is rather mountainous. Pop. (1928), 818,175.

**Girl Guides**, The, the sister movement to that of the Boy Scouts, founded by Lord Baden-Powell shortly after the inception of his Boy Scout movement in 1908. Its aim is to inculcate upon girls of every class self-development in the attributes of Character and Intelligence, Physical Health through Self-knowledge, Service for the Community, and Handicrafts. The Guide Promise and Law, on which the whole training is founded, corresponds with those of the Scout movement. See *Boy Scout Movement*.

**Girodet-Trioson**, Anne Louis Girodet de Roussy (1767-1824), French historical painter. Among his famous pictures are: *Endymion*, *Hippocrates*, *The Deluge*, *The*

*Burial of Atala, Napoleon receiving the Keys of Vienna, and St. Louis in Egypt.*

Gironde, a department of France, on the Bay of Biscay, named from the Gironde estuary; area, 4140 sq. miles. One-third of the surface is waste, and about one-fourth is arable land. The staple production is wine, Médoc, Graves, Côtes, and Entre-deux-Mers being the most celebrated growths. The forests of oak and pine are extensive. The minerals are unimportant, but much salt is obtained from lagoons. The manufactures are varied; the trade, which has its centre at Bordeaux, is very important. Bordeaux is the capital. Pop. (1926), 827,973.

**Girondists**, one of the great political parties of the first French revolution. The Girondists were Republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their fall dates from their unsuccessful impeachment of Marat (1793), soon after which a large number of them were proscribed, and twenty-one of them were condemned and executed.

**Girtin**, Thomas (1775-1802), English water-colour painter. He painted, chiefly, architectural subjects, whose romantic treatment marks an important development from the work of earlier topographical draughtsmen. Girtin was one of the first to use water-colour with the same power and freedom as oil-paint. Despite his early death, he has exercised great influence.

**Girton College**, Cambridge, was founded in 1869 for the higher education of women. The college had its first home in a small house at Hitchin; but before long the distance between Hitchin and Cambridge became an inconvenience, and in 1872 the present building was opened. Since 1881 the students have been admitted to the examinations of the University of Cambridge, and they were granted certificates until 1921. In that year they were first given titles of degrees, but at present the M.A. degree or its equivalent does not carry with it the membership of the Senate. The students generally read for the Honours examinations (triposes) at Cambridge.

**Girvan**, a burgh and seaport of Scotland, county of Ayr, on the River Girvan, near Turnberry. It is a popular holiday-resort. The winter herring fishery is the

most important industry, and there is a good but small harbour. Pop. (1931), 5292.

**Gisborne**, a town in New Zealand (North Island), capital of Cook County, on the Rivers Turanganui and Taruheru. It is the centre of a fine pastoral and agricultural district, and exports wool, frozen mutton, maize, and dairy produce. Petroleum has been discovered there, and there are hot springs in the neighbourhood. It was at Gisborne that Captain Cook landed in 1769. Pop. (1927), 15,370.

**Gissing**, George Robert (1857-1903), British novelist. His first romance, *Workers in the Dawn*, appeared in 1878. It was followed by *Demos*, *Thyrza*, *The Unclassed*, *The Nether World*, *New Grub Street*, and *The Odd Woman*, all gloomy and joyless, but all poignantly realistic. A brighter mood is revealed in his work *By the Ionian Sea*, in the semi-autobiographical *Private Papers of Henry Ryecroft*, and in his monograph on Dickens. *Veranilda*, left incomplete at the author's death, appeared in 1904.—Cf. F. Swinerton, *Gissing: a Critical Study*.

**Giulio Romano**, Giulio Pippi, or de' Giannuzzi (1492-1546), Italian painter, architect, and engineer, the most distinguished of Raphael's pupils. In 1524 he went to Mantua, where he executed a series of remarkable works in architecture, painting, and engineering. He is well represented at Florence, Naples, Paris, Rome, and London (*The Infancy of Jupiter* in the National Gallery).

**Giurgevo**, a town in Romania, on the Danube, opposite Ruschuk. It is the most important shipping port on the Romanian side of the river, and exports grain, petroleum, and salt. Pop. 14,140.

**Giusti**, Giuseppe (1809-1850), Italian satirical and political poet. He is considered by his countrymen as the rival of Béranger.

**Givors**, a town of South-Eastern France, department of the Rhone, and on that river, a centre of the coal trade, with iron-works, glassworks, silk-weaving and dyeing-works. Pop. 12,784.

**Giza**, a town of Egypt, on the left bank of the Nile, opposite Old Cairo. There is a British School of Archaeology at Giza. Pop. (1927), 26,773.—The province of Giza has an area of 409 sq. miles, and a population (1927) of 589,902.

**Glace Bay**, a town, Cape Breton Island,

Nova Scotia, Canada. It is a great coal-mining centre, and other industries are fishing, wood-working, and engineering. A great deal of coal and agricultural produce is shipped. Pop. 17,007.

**Glacial Epoch.** From time to time in geological history a cold epoch has set in, promoting falls of snow instead of rain, and favouring the growth of glaciers. The last of these epochs probably passed from Europe about 7000 B.C. Early hunters fed their families in Southern France and Switzerland on animals now associated with Arctic climes. Though only one stage of ice-retreat, with a subsequent ice-extension, seems traceable in the British Isles, three interglacial stages have been proved for the Alps. The cause of the occurrence of glacial epochs is quite unknown, although attempts have been made to connect them with variations in the radiation of the sun. The discovery of abundant evidence of a world-wide glacial epoch in early Permian times, affecting in a very marked degree what are now tropical regions of the earth, has added greatly to the interest of the problem. When the 'glacial period' is spoken of, it usually means the ice-age of Pleistocene times. James Geikie, in the three editions of his *Great Ice Age*, undoubtedly did most to bring the reality and magnitude of the Pleistocene glacial epoch before readers in the British Isles. W. B. Wright (*The Quaternary Ice Age*, 1914) has admirably discussed and summarized recent work upon the subject.

Glaciers, ice-masses of great bulk, resulting from the compacting of snow as it accumulates on plateaus or in hollows above the snow-line, and becomes pressed outwards to lower levels. Glaciers may extend down valleys far below the snow-line, and may spread out in Arctic lowlands as confluent sheets which melt away along their fronts. Glaciers are continually moving downwards, the rate generally varying from 12 to 24 inches in twenty-four hours. The glacier, as a rule, is terminated by a steep slope. In its middle course it resembles a frozen stream with an undulating surface, broken by fissures or *crevasses*. A stream of ice-cold turbid water always issues from its lower extremity. An important result of glacial action is the formation of *moraines*, which consist of accumulations of stones and detritus piled up on the sides of the

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The problem of the descent of the glaciers is of extraordinary interest, and various theories have been put forward to account for it. It was shown by Professor J. D. Forbes, of Edinburgh, that a glacier progresses much like a river—the middle and upper parts moving faster than the sides and the bottom—and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the *viscous theory* of glaciers, which presupposes that ice is a plastic body, and this plasticity has been satisfactorily explained by Professor James Thomson, of Glasgow, by the phenomenon of *regelation*, i.e. the melting and refreezing of ice under pressure changes.

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in addition to a large number of smaller glands. The lymphatic glands, which filter the lymph, are somewhat different from these in character; and still more different are blood-glands, such as the spleen. Botanists have given the name of glands to small bodies observed upon the surfaces of plants, many of which secrete certain fluids.

Glanvil, or Glanville, Ranulph de (d. 1190), English lawyer. In the reign of Henry II he held the office of justiciary. To Glanvil is attributed a treatise on the laws and customs of England (*De Legibus et Consuetudinibus Angliæ*), written about 1181, and first printed in the year 1554 (at the instance of Sir W. Stanford), being the earliest treatise on English law.

Glarus, a Swiss canton, surrounded by St. Gall, the Grisons, Uri, and Schwyz; area, 267 sq. miles. On all sides, except towards the north, Glarus is walled in by lofty mountains. The inhabitants are chiefly engaged in the cotton manufacture and in agricultural pursuits, rearing sheep and cattle, and exporting cheese, butter, &c. The Constitution is a pure democracy. Pop. 33,834. The capital, Glarus, situated on the Linth, has a good trade. Pop. 4877.

Glasgow, the largest city in Scotland, and the second largest in the United Kingdom, is situated mainly in the county of Lanark, on both banks of the Clyde, the larger and more important part of it on the right or north bank. In 1893 Glasgow was made a county by itself. Since 1912 the city has included Govan and Partick, formerly separate municipalities. Further extensions were authorized in 1925. The river is crossed by eleven bridges (including railway bridges) and by ferries; and there are also tunnels under it. Of the buildings the Cathedral, situated in the north-east of the city, is the most noteworthy. It is especially distinguished for the beauty of its crypt or lower church, one of the most perfect in Britain. Among other noteworthy buildings are the University, the Art Galleries, the Municipal Buildings, various churches, the Royal Infirmary, the Western Infirmary, Royal Exchange, Athenæum, General Post Office, Technical College, Christian Institute, and the terminal stations (Central, St. Enoch, &c.). In addition to the extensive open space called the Green, Glasgow has a number of fine public parks, while some

years ago a large tract of mountain land on the Firth of Clyde was presented to the city, and in 1915 the Corporation purchased Loch Lomond Park. There are also Botanic Gardens with extensive hothouses. The principal libraries are the University Library, the Mitchell Library, the Stirling Library, Baillie's Institution Library, and the various Corporation district libraries, all free reference libraries; and the libraries of the Faculty of Medicine, the Faculty of Procurators, and other learned bodies. St. Andrew's Halls are the finest suite of public halls, the City Hall is also a notable meeting-place, and the Kelvin Hall is a huge building specially designed and admirably adapted for exhibitions on a large scale. There are numerous theatres, music halls, and picture-houses. Among educational institutions, in addition to the University, are Anderson's College Medical School, the Royal Technical College, Trinity (formerly U.F.) College, Queen Margaret College for Women, St. Mungo's College, the normal or training institutions for teachers in Glasgow district, the Glasgow School of Art, the Glasgow Athenæum, the West of Scotland Agricultural College, the Veterinary College, the High School of Glasgow, the Girls' High School, the Glasgow Academy, the Kelvinside Academy, Allan Glen's School, and the Hutchesons' Grammar Schools. There are numerous infirmaries, hospitals, and charitable institutions. There are also military barracks in Maryhill. The industries include cotton, linen, woollen, silk, and jute; calico-printing, dyeing, and bleaching; pig and malleable iron and steel; brass and copper; iron tubes and pipes, bolts and rivets, armour-plates, bridges, roofs, and other forms of metal work; general mechanical engineering, boilermaking, locomotives, textile machines, sewing-machines, machine tools; chemical - works, potteries, glass-works, brickworks, breweries, distilleries, tanneries, tobacco-works, sugar-refining works, and soapworks. Shipbuilding is a staple industry, Clyde-built ships being universally renowned, and the annual tonnage output of the river being the largest in the world. The commerce is also great and varied. The river itself, the chief highway of commerce, has been made navigable for large vessels up to the heart of the city, and there is extensive harbour accommodation, partly in the river and

partly in the connected docks. The total quay length is 17,080 yards, water area 304 acres, and the principal docks (all tidal) are *Kingston*, *Queen's*, *Prince's*, *Rothsay*, and *King George V*. All these docks are amply fitted for working cargo and loading coal, and there is accommodation for vessels up to 20,000 tons, drawing 30 feet. There are several graving-docks, the largest being 880 feet long. The docks under construction at Renfrew will accommodate the largest ships. Glasgow has direct communication with all parts of the world. The railways are, of course, the chief means of inland traffic, and the Forth and Clyde and Monkland Canals form auxiliaries. There is a cable subway in the city, and a tramway system at one time unrivalled. The city is supplied with water from Loch Katrine.

The origin of Glasgow may be traced to the foundation of the Cathedral by St. Kentigern (or Mungo) about 560. The bishopric was founded in 1115. Glasgow was erected into a burgh of barony about 1180, and became a free royal burgh in 1611. Glasgow Fair, now the chief holiday season of the city, was instituted about 1190. The Clyde was already crossed by a bridge in the thirteenth century, but the earliest stone bridge dates from the fourteenth. The Provost (now Lord Provost) is first mentioned in 1454. A convent of Dominicans or Black Friars was founded in 1246, and a Franciscan house in 1476. The General Assembly which abolished Episcopacy in Scotland met in Glasgow Cathedral in 1638. Port-Glasgow was founded as the port of the city in 1668, but in the following century the deepening of the river up to the city was begun. In 1715 and 1745 Glasgow was conspicuously loyal to the reigning family. Up to the Union its trade was chiefly with the European continent. The Union opened up the trade with the American colonies, and tobacco became a source of wealth to the Glasgow merchants. The Monkland Canal was made in 1770, and the Forth and Clyde Canal was opened in 1790. The pioneer steamboat *Comet* began to ply on the Clyde in 1812. International exhibitions were held in 1888, 1901, and 1911. Pop. (1931), 1,088,417.—BIBLIOGRAPHY: A. Magee, *Old Glasgow*; Sir J. D. Marwick, *Early Glasgow*; G. Eyre-Todd, *The Story of Glasgow*; Renwick and Lindsay, *History of Glasgow*.

Glasgow University was founded by a Bull of Pope Nicholas V, 1450–1451, on the model of the University of Bologna. In 1577 James VI prescribed rules for the government of the University, giving it a new charter. It has been reconstituted by the Scottish Universities Acts of 1858 and 1889, and its constitution is similar to that of the others. In 1864 the University moved to the present buildings on Gilmorehill. The University comprises six faculties, viz. arts, science, engineering, theology, law, and medicine. With it is incorporated Queen Margaret College for women. The exhibitions, scholarships, bursaries, &c., from funds administered by the University have an annual value of about £8000. The degrees conferred are almost the same as at Edinburgh. There are about 160 professors and lecturers, and approximately 4600 students. The University library numbers about 250,000 volumes.

Glass is a comparatively hard and brittle substance having no visible crystalline structure. It has a characteristic conchoidal fracture, and a surface that naturally reflects or refracts light regularly. Although it occurs in nature as obsidian, which has no commercial value, glass is essentially an artificial product, resulting most generally, but not invariably, from the fusion of silica with metallic oxides. Transparency is the most valuable of its physical qualities, which may be varied through every degree of translucence and colour by suitable combinations of the ingredients. It is most extensively used as window glass. Special types of very transparent glass having particular refractive and dispersive powers are essential for the manufacture of optical instruments. It provides a suitable material for the construction of utensils such as bottles and chemical vessels, owing to its power of resisting the solvent or corrosive action of most liquids and acids. It is readily soluble in hydrofluoric acid. It is a bad conductor of heat, being about 120 times worse than iron, and six times worse than quartz. When glass is heated sufficiently, it can be cast, blown, drawn, or moulded to any desired form, or even spun into fine threads.

Glass may conveniently be classified according to its use, as, for example: (1) *Window glass*, including: hand blown and flattened; mechanically blown and flat-



tened; continuously mechanically drawn; rolled and polished plate glass; corrugated and figured. (2) *Bottle glass*, including: hand blown and automatic machine-made bottles. (3) *Pressed glass*. (4) *Blown glass*, including: chemical and temperature resistant glassware; hand blown and finished without moulds; hand blown in moulds; drawn tubing. (5) *Optical glass* of very many varieties.

Silica is the principal ingredient of practically all glass. Many substances are available for fusion with silica to form glass, and such fusion may take place at the ordinary furnace temperature of about 1200° C. to 1400° C. Clear hard crown glass suitable for window glazing may consist of silica 72 per cent, lime 11 per cent, soda 17 per cent. Glass for blown ware may be either crown or flint. For the most brilliant cut-glass table ware, flint having a composition of silica 55 per cent, lead 10 per cent, and potash 35 per cent may be used. Many varied and beautiful colours are obtained by the introduction of metals or metallic oxides. Traces of cobalt produce a strong blue; copper may give the same colour; gold and copper colour glass ruby-red, and chromium green. Uranium produces a yellow-green glass, which is also fluorescent and is used for making X-ray screens. A minute proportion of iron colours glass green. Manganese imparts a reddish-violet colour. Ultra-violet glass, which has a dense violet colour, is opaque to most visual rays, but transparent to ultra-violet rays. It contains about 5 per cent of nickel oxide.

For the melting of comparatively small batches of glass, fire-clay pots are used. Tank furnaces are used for the large quantities required in the manufacture of window glass or the mass production of bottles. The constituents of the batch are well ground and mixed, and to the batch is added a proportion of glass chips termed cullet, which facilitates the fusion of the ingredients. From the pot the glass is gathered upon the end of a hollow blow-iron, and is then blown into the required shape. Glass can also be pressed solid in moulds into many shapes, such as pavement lights. Window glass is hand-produced by gathering a large mass of glass on the blow-iron, and forming it into a cylindrical mass by rolling upon a smooth-shaped block called a marver. By careful

blowing a hollow cylinder is formed. The cylinder is placed within a flattening furnace, upon the smooth floor of which it is opened out and flattened by means of a smoothing block. The plate is then removed and slowly cooled. For the mass production of bottles and similar articles many ingenious automatic machines are employed.

Articles made of glass must be cooled slowly to avoid fracture, and still more slowly to anneal them, that is, to eliminate stresses that may ultimately cause them to break. For spectacles a good hard type of crown glass is employed. Tubing is still generally produced by a hand process of drawing.

Table and fancy glassware can be very effectively decorated in a great variety of ways. The patterns may be cut into the glass by grinding and polishing wheels, rouge or putty powder being used as a polishing medium. They may be etched by means of hydrofluoric acid acting upon portions of the glass surface, the remaining portions being protected by a coating of bees-wax or bituminous compound, which is later dissolved away, or the pattern may be sand-blasted through the apertures of a stencil laid upon the glass surface.—BIBLIOGRAPHY: W. Rosenhain, *Glass Manufacture*; W. A. Shenstone, *Glass Blowing*.

**Glass-painting.** See *Stained Glass*.

**Glass Snake**, a lizard (*Ophisaurus apus*), in form resembling a serpent, and reaching a length of 3 feet. It is related to the *blind-worm* (q.v.). It is native to the Balkans, South Russia, Morocco, and Asia Minor.

**Glasswort**, a name given to the plants of the genus *Salicornia*, nat. ord. Chenopodiaceae, marine herbs growing on the coasts in the south of Europe and north of Africa, and yielding, by burning, ashes containing soda. Two or three species are natives of Britain.

**Glastonbury**, a borough of England, county of Somerset. It was famous for a thorn tree supposed to have been planted there by Joseph of Arimathea. It is closely connected with Arthurian legend, and is identified with the Island of Avilion, Arthur's burial-place. It also derives interest from the ruins of its once magnificent Benedictine abbey, dating to the twelfth century. Pop. (1931), 4515.

**Glatz**, a town of Germany, province of

Silesia, on the Neisse. It manufactures woollens, leather, carpets, &c. Pop. 17,095.

**Glauber**, John Rudolph (1604-1668), German chemist. He is chiefly remembered for his discovery of sulphate of soda or *Glauber's Salt*,  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ , which he termed *sal mirabile*, because of his faith in its medicinal qualities.

**Glauchau**, a town of Saxony, on the Mulde. Woollens, carpets, linens, and leather are manufactured, and there are dyeworks and print-fields. Pop. (1925), 29,618.

**Glaucoma**, in medicine, an almost incurable disease of the eye, in which the eyeball becomes of stony hardness by the accumulation of fluid within.

**Glaucinite**, a soft green mineral occurring as an infilling of foraminiferal shells, is a hydrous silicate of iron and potassium, with some calcium. It is well known in the greensands (q.v.) of all ages, and its potash-content, some 3 to 8 per cent, adds to the fertility of soils formed on these rocks.

**Glazebrook**, Sir Richard Tetley (1854- ), British physicist, director of the National Physical Laboratory 1899-1919. His work has been principally in optics and electricity, and he has published various textbooks.

**Glazing** is the covering of earthenware vessels with a vitreous coating in order to prevent their being penetrated by fluids. A mixture of equal parts of oxide of lead and ground flint is generally used.

**Gleiwitz**, a town of Prussia, in the plebeiscite area of Upper Silesia. It is situated near the mines, and has foundries, machine-works, glassworks, worsted and other mills. Pop. 69,028.

**Glencoe**, a valley in the county of Argyll, near the head of Loch Etive. It is bounded on both sides by almost perpendicular mountains over 3000 feet high. The valley was the scene of a tragedy known as the Massacre of Glencoe. In 1691 a proclamation was issued promising pardon to all Highlanders who should swear allegiance on or before 31st Dec., 1691. MacDonald of Glencoe did not comply till 6th Jan., 1692. On the 1st of Feb. a party of soldiers, commanded by Captain Campbell of Glenlyon, marched up the glen and took quarters as friends. At five in the morning of the 13th Glenlyon and his men suddenly fell on the MacDonalds. Thirty-eight men were murdered,

but many who had escaped perished in the snow, sank into bogs, or died for lack of food.

**Glendalough**, a picturesque vale near the middle of County Wicklow, Ireland.

**Glendower**, Owen (1359-1415), last national leader of the Welsh people. Having raised a considerable force, he caused himself to be proclaimed Prince of Wales on 20th Sept., 1400. He defeated the king's troops, and, retiring to the mountains, foiled all subsequent attempts to bring him to action. He afterwards joined the coalition of the Percys against Henry, and was crowned 'sovereign of Wales'. Finding it impossible to subdue him, Henry V, in 1415, condescended to treat with him; but Owen died during the negotiation.

**Glengarry**, Scottish parish and glen, Inverness, traversed by the Garry.

**Glenlivet**, a valley or district of Scotland, in the county of Banff. Whisky of a particularly fine flavour has long been made in the district. Pop. 1263.

**Glen Roy**, a deep valley in the Highlands of Scotland, parallel to Glenmore (the Great Glen), in Lochaber, Inverness-shire. It is nearly 14 miles in length, and little more than  $\frac{1}{2}$  mile in breadth, and is celebrated for its so-called *Parallel Roads*, which are three parallel terraces running along either side of the glen. Most authorities agree that the roads are shore-lines of freshwater lakes. As, however, no land-barrier is discoverable in the vicinity, they refer the lake or lakes to the Glacial period, holding that glaciers must have descended from Ben Nevis and dammed up the water in Glen Roy.

**Glentilt**, a mountain valley in Scotland, Perthshire, traversed by the Tilt.

**Gliding**, the art of flying in an engineless machine provided with planes, was the forerunner of modern flying, but it was not till 1930 that it became a popular sport. In that year a great wave of enthusiasm spread from Germany throughout Europe, and to Britain and America. The activities of the British Gliding Association were responsible for the popularity of the sport in the United Kingdom, and clubs were formed at many centres.

**Globe-fish**, the name given to several fishes, order Plectognathi, remarkable for possessing the power of blowing their bodies up into a globe-like shape.

**Globe-flower**, a popular name of *Trollius europæus* (nat. ord. Ranunculaceæ), a

common European plant in mountainous regions, having five-lobed, deeply serrated leaves and round pale-yellow blossoms.

**Globigerina**, one of the perforate Foraminifera, found fossil in the Chalk and Tertiary formations, and still so abundant in the sea that its shells form vast calcareous deposits known as 'globigerina ooze'.

**Globulin**. See *Proteins*.

**Glockner**. See *Gross Glockner*.

**Glogau**, a German town in Silesia, on the Oder. It has a good trade. Pop. 24,524.

**Glommen**, the largest river in Norway, issues from Lake Oresund, in the south-east of South Trondhjem, and after a course of above 370 miles falls into the Skagerrak at Frederikstadt.

**Glossop**, a borough of England, in Derbyshire. It is the principal seat of the Derbyshire cotton manufacture, and there are also woollen- and paper-mills, iron-foundries, &c. Pop. (1931), 19,510.

**Glottis**. See *Larynx*.

**Gloucester, Duke of**. This title was conferred on Prince Henry, third son of King George V, in March, 1928.

**Gloucester**, a city, county of itself, and river port, England, capital of the county of same name, on the left bank of the Severn, here divided into two channels enclosing the Isle of Alney and crossed by two fine bridges. It carries on a considerable shipping trade, the Gloucester and Berkeley Canal giving access to the docks, which can accommodate vessels of 800 tons drawing 14 feet. Sharpness is the port of Gloucester. The most remarkable public edifice is the cathedral. The schools include the collegiate school founded by Henry VIII, the theological college, the blue-coat school founded in 1666 (and now known as Sir Thomas Rich's School), and the grammar-school of St. Mary de Crypt, founded in the time of Henry VIII. The main industries are engineering and the manufacture of oil-cake, chemicals, &c. Pop. (1931), 52,937.

**Gloucester**, the county, is bounded by the Severn, Monmouth, Hereford, Worcester, Warwick, Oxford, Berks, Wilts, and Somerset; area, 805,842 acres, of which five-sixths are under crops and pasture. The county is naturally divided into three distinct districts, the Hill or Cotswold in the east, the Severn valley in the middle, and the Forest of Dean in

the west. The principal rivers are the Severn, with its affluents the Wye, the Leden, and Lower and Upper Avon; and the Thames, with its affluents the Colne, Churnet, and Windrush. Iron and coal are found in the Forest of Dean. Coal is also found and extensively worked in the south part of the county; and lead ore is found in various parts. Limestone and freestone are also met with. Agriculture is in a flourishing state, especially in the vale districts of the county. Gloucester is, however, much more of a dairy than an agricultural county. Orchards are numerous, from the produce of which large quantities of cider are made. Gloucester is a considerable manufacturing county, and has been long famous for its fine broadcloths. Pop. (1931), 785,656.

**Gloucester**, a town and port of Massachusetts, U.S.A., near the extremity of Cape Ann. It is a popular summer-resort, and one of the greatest fishing centres in the United States. The harbour affords anchorage for the largest vessels. Pop. 22,947.

**Glover**, Richard (1712-1785), English poet. He was the author of two epics, *Leonidas* and the *Atheniad*; *London, or the Progress of Commerce*; and three tragedies, *Boadicea*, *Medea*, and *Jason*. His *Diary* was published in 1813.

**Gloversville**, a town, New York, 44 miles north-west of Albany. Glove-making is the principal industry. Pop. 22,075.

**Gloves** are made of leather, fur, cloth, silk, linen thread, cotton, or worsted. The chief leathers used in glove manufacture are doe, buck, and calf-skins; sheep-skin for military gloves; lamb-skin for many of the so-called kid gloves; true kid for the best and finest gloves; dog, rat, and kangaroo skins, &c. Leather gloves are usually cut out by means of dies. The best woollen, thread, and silk gloves are made by cutting and sewing, but commoner gloves are made by knitting and weaving. In England leather gloves are manufactured at London, Worcester, and elsewhere. Gloversville, in New York, is the chief American seat of the manufacture. Italy, Belgium, Sweden, Denmark, and Germany all manufacture excellent gloves, but France supplies the world with most of the finer and more expensive kinds. Large quantities of cotton gloves are manufactured at Nottingham and Leicester.

**Glow-worm**, an insect of the genus *Lampyrus* (*L. noctilūca*), of the order Coleoptera. The name is strictly applicable only to the wingless female of the species. She emits a shining green light from the extremity of the abdomen to attract the male, who, though given wings, has been gifted with much less luminous organs. The larvæ are greedy and active, and live on snails. Belonging to the same family are the fire-fly and the railway beetle.

**Gloxinia**, a genus of plants, nat. ord. Gesneraceæ, distinguished by the corolla approaching to bell-shaped. The species were introduced into Britain from tropical America, and are now favourite hothouse plants. See *Sinningia*.

**Gluchov**, or **Gloukhov**, a town of the Ukraine, government of, and 148 miles east by north from, Tchernigov. Pop. 14,856.

**Glucinum**. See *Beryllium*.

**Gluck**, Christoph Willibald (1714–1787), German musical composer. In 1740 he was employed to compose an opera for the court theatre of Milan. The text chosen for him was the *Artacæres* of Metastasio, and the opera was a triumph. In 1742 he wrote *Demofoonte* for Milan, *Demetrio* and *Ipermestra* for Venice; in 1743 *Artamene* for Cremona, and *Siface* for Milan; in 1744 *Fedra* for the same theatre; and in 1745 *Alessandro nell' Indie* for Turin, all founded on classical subjects. The *Trionfo di Clelia* (1762) was the last of his operas in his first style. The earliest of his operas in his second style was the *Orfeo ed Euridice*, performed publicly for the first time in 1762. This opera marked a new era. In 1766 his second great opera, *Alceste*, was produced. *Iphigénie en Aulide* (1774) was followed by the *Armide* in 1777, and by the *Iphigénie en Tauride* in 1779, Gluck's last important work, and by many considered his greatest. It ends the series of works which gave a direction to the operatic genius of Méhul and Cherubini in France, and of Mozart and Beethoven in Germany.—Cf. E. Newman, *Gluck and the Opera*.

**Glucose**, also known as dextrose or grape-sugar, is a carbohydrate occurring naturally in honey, grapes, and other fruit. It is also present in the urine of persons suffering from *diabetes mellitus*. It is manufactured by boiling starch with dilute sulphuric acid. Pure glucose forms a colourless crystalline mass melting at

86° C., and losing its one molecule of water of crystallization at 110° C. Its solution rotates the plane of polarized light to the right (*dextro*-rotatory). It is readily fermented by yeast. Glucose is formed, together with an equal quantity of fructose, when cane-sugar is boiled with dilute acids.

**Glucosides**, a group of carbon compounds (including amygdalin, salicin, &c.) occurring in the vegetable kingdom, and characterized by the fact that on hydrolysis or saponification with dilute acids a sugar, usually glucose, is formed along with other products.

Glue consists of a sticky gelatinous material obtained from the cartilaginous substance of hides, bones, fish-skins, &c., from which it is prepared by prolonged boiling with water.

The best-quality brown glues (*leather glue* or *skin glue*) are obtained from hides, but the skins of sheep and other animals are largely used in the preparation of good-quality light-coloured glues. *Bone glue* is largely prepared in connexion with the manufacture of bone meal and phosphorus. *Fish glue* is prepared from the skins of fish, the heads and bones of cod, and also from whale blubber when freed from oil. *Marine glue* consists of a solution of india-rubber in turpentine, to which is added powdered asphalt or shellac.

**Glutton**, a carnivorous quadruped of the weasel family, about the size of a large



Glutton (*Gulo luscus*)

badger, found in the north of Europe and America, where it is known as the *wolverine*. It is a slow-moving, fierce, cunning animal of great strength. Its fur is valuable.



**Glycerine**, or **Glycerol**,  $C_3H_5(OH)_3$ , is a trihydric alcohol which does not occur naturally in the free state, but always in combination with fatty acids as the essential constituent of fats and oils of animal or vegetable origin. It was discovered by Scheele in 1779.

The hydrolysis ('saponification') of the fat is carried out by boiling with caustic soda solution; the soap is then salted out. The residual lye contains practically all the glycerine present in the original fat. This lye is filtered, evaporated, and finally distilled with superheated steam. Pure glycerine is a colourless viscid liquid with a sweet taste, having a specific gravity of 1.265. Glycerine is used for the manufacture of explosives, also in dyeing, calico-printing, and in the manufacture of leather.

**Glyptodon**, a gigantic fossil edentate animal, closely allied to the armadilloes, found in the Upper Tertiary and the Quaternary strata of South America.

**Gmünd**, a town of Württemberg, on the Rems, formerly an imperial free city. It has an extensive museum of industrial products. The manufactures are chiefly woollen and cotton goods, jewellery, and trinkets. Pop. (1925), 20,406.

**Gmunden**, a town of Upper Austria, 35 miles south-west of Linz. Most of the inhabitants are employed in the neighbouring salt-mines. Gmunden is a favourite health-resort and summer residence. Pop. 7190.

**Gnat**, the name applied to several species of insects belonging to *Culex* and related genera. The name is also given to the much smaller *midges* (q.v.). The common gnat (*C. pipiens*) is found in most parts of the world, and is best known for its sting inflicted by the female, whose proboscis is a tube containing four super-fine spiculae dentated or edged. The eggs are laid in a long mass on the surface of stagnant water. After about twenty days as larvæ they are transformed into chrysalids, and after three or four days like this the perfect insect emerges. See *Mosquito*.

**Gneisenau**, August Wilhelm Anton, Count Neithardt von (1760–1831), Prussian general. As chief of Blücher's staff he chiefly directed the strategy of the Prussian army at Waterloo.

**Gneiss**, a species of rock, composed of quartz, felspar, and mica, with a foliated

or banded structure. The layers are often crumpled. Gneiss passes on one side into granite, from which it differs in its foliated structure, and on the other into mica-schist. It contains no fossil remains. Gneiss is the principal rock of very extensive districts.

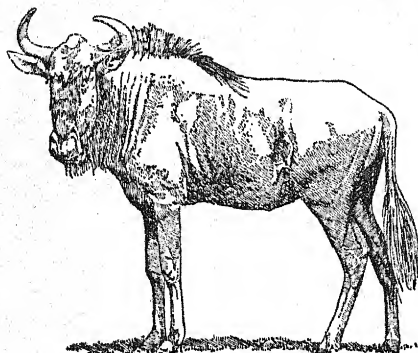
**Gnesen**, a town of Poland, formerly in Prussia, province of Posen. It has a cathedral, in which the Kings of Poland used to be crowned. Sugar, leather, and machinery are manufactured. Pop. 25,339.

**Gnosticism**, a general term applied to the theories of certain early schools of speculators, which combined the fantastic notions of the Oriental systems of religion with the ideas of the Greek philosophers and the doctrines of Christianity. They nearly all agreed on the points that God is incomprehensible; that matter is eternal and antagonistic to God; that creation is the work of the *Demiurge*, an emanation from the Supreme Deity, subordinate or opposed to God; and that the human nature of Christ was a mere deceptive appearance.

The Nicolaitans mentioned in the *Revelation of St. John*, so called from Nicolas, a deacon of the Church at Jerusalem, were one of the earliest quasi-Gnostic sects, and are described as forerunners of the Cerinthians. Carpocrates and the sect of the Ophites (beginning of the second century), to whom the term Gnostic was first applied, saw in the Serpent a wise and good being. The later Gnostics have been divided into three schools. The first was the Syrian, founded by Menander, a pupil of Simon. The second was the school of Alexandria, represented by Basilides and Valentinus. A third school of Gnosticism, whose centre was Asia Minor, was represented by Marcion of Pontus, who flourished about the middle of the second century. Towards the end of the second century Tatian, a Syrian Christian, adopted Gnostic doctrines and founded a sect. Bardesanes, a Syrian, and Hermogenes, an African, apostatized from Christianity in the reign of the Emperor Commodus, and established sects which bordered upon Gnosticism. There have been no Gnostic sects since the fifth century.—**BIBLIOGRAPHY:** C. W. King, *The Gnostics and their Remains*; H. L. Mansel, *The Gnostic Heresies of the First and Second Centuries*.

**Gnu**, the *Wilbeeste* of the colonists,

the name given to three species of South African antelope. (1) *Connochætes gnu*, the white-tailed gnu or black wildebeeste, is now rarely found south of the Vaal. They are about 9 feet long and stand



Brindled Gnu (*Connochætes taurinus*)

about 4 feet high. They live in herds, and, if taken when young, are easily domesticated. (2) *C. taurinus*, the blue or brindled gnu, is larger than the common gnu, and is fairly common. (3) *C. albugulatus* is found in British East Africa.

Goa, a city in India, on the Malabar coast, capital of the Portuguese colony of the same name. It was once the chief emporium of commerce between the East and West, and had a population of 200,000, but it is now nearly deserted. Pop. 2302. New Goa or Panjim was chosen as the residence of the Portuguese viceroy in 1759, and in 1843 it was made the capital of Portuguese India. It is situated on the left bank of the Mandavi, and contains many fine public buildings. The trade is now inconsiderable. Pop. 9325. The colony around Goa belonging to the Portuguese has an area of 1469 sq. miles. It is well watered and fertile. There are numerous salt-works. Pop. 515,772.

Goalpara, a district of British India, in Assam; area, 3897 sq. miles; pop. 462,000. It lies on both sides of the Brahmaputra, and rice is the staple crop. Brass and iron utensils, and gold and silver ornaments are manufactured. The town of Goalpara is the chief centre of trade. Pop. 5400.

Goat, a well-known horned ruminant quadruped of the genus *Capra*, about the

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size of a sheep. Their horns are hollow, and the male is generally bearded. They live on mountains, and can subsist on very coarse food. Their milk is sweet and nutritious, and their flesh is eaten. Goats are generally subdivided into ibexes and goats proper. They are found all over the world. Many varieties are valued for their hair or wool, and the skin, when prepared, is of some commercial value. The Kashmir goat is smaller than the common domestic goat, and has long, silky, fine hair. The Angora goat also has soft silky hair of a silver-white colour. The Rocky Mountain goat is the *Haplocærus montanus*, or big-horn (q.v.). The domestic goat is supposed by some authorities to be the descendant of the *C. cægrus* or wild goat of Asia.—Cf. R. Lydekker, *Wild Owen, Sheep, and Goats*.

Goat Island, a small island of 70 acres, which divides the current of the Niagara River at the Falls. It is connected with the American shore by a bridge.

Goat-moth, a large British moth (*Cossus ligniperda*), ash-coloured, with numerous small black lines on the first pair of wings.

Goat's-beard, the general name of plants of the genus *Tragopogon*, order Compositæ, herbaceous perennials, chiefly natives of Europe. The yellow goat's-beard (*T. pratensis*), greater goat's-beard (*T. major*), and purple goat's-beard (*T. porrifolius*) are found in Britain.

Goat's-rue (*Galëga officinális*), a leguminous plant indigenous to the south of Europe. It is supposed to increase the milk of cows that feed upon it.

Goat's-thorn, a name given to two hardy evergreen plants of the genus *Astragalus*, *A. Tragacantha* (great goat's-thorn) and *A. Poterium* (small goat's-thorn).

Goatsucker, a name common to the birds of the genus *Caprimulgus*, as also to all belonging to the same family, the Caprimulgidae, given originally from the erroneous opinion that they suck goats. The European goatsucker or fern-owl (*C. europæus*) is a summer visitor. It has a peculiar jarring note which wins for it the name of *night-jar*. It is 10 inches long, and its plumage is of so nondescript a colouring that it is difficult to see the bird when perched on a branch.

Gobelins Manufactory, a tapestry manufactory at Paris, established by Col-

bert in 1667, on the site of a previously existing manufactory which had been set up by Jehan Gobelin, a celebrated dyer in the reign of Francis I. The Gobelins, closed during the Revolution, has continued since the restoration of the Bourbons to be the first manufactory of the kind in the world.

**Gobi**, *The*, the *Shamo* or 'sand-sea' of the Chinese, an immense tract of desert country, occupying the central part of the high tableland of Eastern Asia, and extending over a large portion of Mongolia. Of recent years there has been a considerable amount of Chinese immigration to the fertile districts of The Gobi. Its length is probably about 1500 miles; mean breadth, between 350 and 400 miles; area, about 300,000 sq. miles. The East Gobi is occupied by different tribes of the Mongolian race, who have numerous herds of camels, horses, and sheep. In the West Gobi are some nomadic tribes of the Tatar race.

**Goby**, the general name of a family of spiny-finned fishes (Gobiidae). About 600 species are known, and some are common on the British coast. They can live out of water for some time. The family does not include any important food-fishes.

**Godalming**, a municipal borough of England, in Surrey, on the River Wey, which is navigable from this point. There are tanneries, paper-mills, &c. Pop. (1931), 10,400. On an elevated plateau to the north stands the Charterhouse School.

**Godavari**, a large river of Central India, which rises about 50 miles from the shore of the Indian Ocean, flows across the Deccan from the Western to the Eastern Ghats, and falls by three principal mouths into the Bay of Bengal after a course of 900 miles. The Godavari is one of the twelve sacred rivers of India, and bathing in its waters washes away all sins.

**Godavari**, a large British district of the Madras Presidency; area, 7972 sq. miles; pop. 2,078,782. Coringa and Coconada are its chief ports.

**Goderich**, a port in Ontario, Canada, on Lake Huron, with manufactures of iron-castings and machinery, salt-refineries, fisheries, and large shipping trade. It has a fine climate, and is a favourite holiday-resort. Pop. 4107.

**Godesberg**, a health-resort in the Rhineland, Germany, in a magnificent position on the left bank of the Rhine, nearly opposite 'the castled crag of Drachenfels'. Pop. 10,644.

**Godfrey**, Sir Edmund Berry (1621-1678), the magistrate who received the depositions of Titus Oates with regard to the alleged Popish Plot. He was soon after found dead. His death was imputed to the resentment of the Papists, and the excitement aroused was the actual cause of the Popish Plot agitation.

**Godfrey of Bouillon** (1061-1100), leader of the first Crusade, son of Eustace II, Count of Boulogne. In order to expiate his sin of fighting against the Pope, he took the cross for the Holy Land in 1095, and led 80,000 men to the East by way of Constantinople. The town of Antioch fell into their hands in 1098, and in the following year Godfrey took Jerusalem itself after a five weeks' siege. The defeat of the Egyptians at Ascalon placed him in possession of all the Holy Land excepting two or three places. Godfrey was a favourite subject of mediæval poetry, and is the central figure of Tasso's *Jerusalem Delivered*.

**Godiva**, the wife of Leofric, Earl of Mercia and Lord of Coventry in the reign of Edward the Confessor, heroine of a celebrated tradition. In 1040 Godiva appealed to her husband to relieve the inhabitants of Coventry of certain exactions imposed on them. Leofric, however, only laughed at her, and when she persisted in her entreaties at last said to her, half jocularly, that he would grant her request if she would ride naked through the town of Coventry. She took him at his word; according to one version of the legend, her wealth of hair covered her; according to another, everyone kept indoors until she had accomplished her ride. Only one person, 'Peeping Tom', the story says, attempted to look out, and he was immediately struck blind.

**Godolphin**, Sidney Godolphin, Earl of (1645-1712), English politician. During the reign of Anne he was appointed Lord High Treasurer of England, and in this office did much to improve the public credit, and check corruption in the administration of the public funds.

**Godoy**, Manuel (1767-1851), Duke of El Alcudia, better known as the *Prince of the Peace*, Spanish royal favourite and minister. In 1791 he became adjutant-general of the guards, in 1792 lieutenant-general, Duke of El Alcudia, grandee of Spain of the first class, and Prime Minister. As he used his vast power in the promotion

of French more than Spanish interests, he became extremely unpopular, and the hatred of the people became so great in 1808 that he had to take refuge in France. He ended his days in obscurity and poverty.

**God save the King.** See *National Airs*.

**Godthaab**, the oldest settlement in, and capital of, South Greenland. It stands on Davis Strait, and has a good harbour. Pop. 1000.

**Godwin**, Earl of Wessex (990-1052), English statesman. During the reign of Edward the Confessor Godwin was compelled to quit the kingdom. In 1052, however, he returned with an army and caused the expulsion from the kingdom of most of the Norman intruders. He was the father of King Harold (q.v.).

**Godwin**, Mary (1759-1797), English miscellaneous writer, also well known by her maiden name of Wollstonecraft. In 1786 she published *Thoughts on the Education of Daughters*. This was followed by an answer to Burke's *Reflections on the French Revolution*, the *Vindication of the Rights of Woman*, and other works. She died soon after giving birth to a daughter, who became the wife of Shelley the poet. Among her other works are a *Moral and Historical View of the French Revolution*, and *Letters from Sweden, Norway, and Denmark*.—Cf. *A Defence of the Character and Conduct of the late M. W. Godwin* (anonymous).

**Godwin**, William (1756-1836), English novelist and political writer. In 1793 appeared his *Inquiry concerning Political Justice*. The next year appeared his novel of *Caleb Williams, or Things as they Are*, which rapidly and deservedly attained an immense popularity. His *Cursory Strictures on the Charge of Chief-Justice Eyre* (to the jury, in the trial for high treason of Holcroft, Horne Tooke, and others) contributed materially to the acquittal of his friends. In 1799 he published a new novel, *St. Leon*. Among his subsequent works are: *Faulkner*, a tragedy, published in 1807; an *Essay on Sepulchres*, in 1808; *Mandeville*, a novel, in 1817; *A Treatise on Population*, in reply to Malthus, in 1820; *History of the Commonwealth of England*, 1824-1828; *Cloudesley*, a novel, in 1830; *Thoughts on Man*, in 1831; and *Lives of the Necromancers*, in 1834.—Cf. C. K. Paul, *William Godwin: his Friends and Contemporaries*.

**Godwin - Austen**, Mount, a great Himalayan peak, 28,278 feet high, next to Mount Everest the highest on the globe. It received its name in 1888 after Lieutenant-Colonel H. H. Godwin-Austen (1834-1923).

**Godwit**, the common name of the members of a genus of birds (*Limosa*) belonging to the family Charadriidae (plovers). Godwits are long-legged birds with elongated slightly-upcurved beaks.

**Goes**, a fortified port in Holland, in the province of Zeeland, on the Island of South Beveland. It has a considerable commerce. Pop. 7620.

**Goethe**, Johann Wolfgang von (1749-1832), German poet, dramatist, and philosopher. He was sent to the University of Leipzig to prepare himself for the legal profession, but he did not follow any regular course of studies. In 1768 he left Leipzig, and, after an illness of some length, went in 1770 to the University of Strasbourg to pursue the study of law. At Strasbourg he became acquainted with Herder—a decisive circumstance in his life. In 1771 he took the degree of Doctor of Jurisprudence, and wrote a dissertation on a legal subject. *The Sorrows of Werther* appeared in 1774. The attention of the public had already been attracted to Goethe, however, by his drama *Götz von Berlichingen* (published 1773).

Not long after the publication of *Werther*, Charles Augustus, the hereditary Duke of Saxe-Weimar, invited Goethe to his court. Wieland was already there, having been the duke's tutor; Herder was added to the band in 1776; Schiller was afterwards one of its members for a few years; and other poets and critics and novelists were gathered round these chiefs. Goethe was the leading spirit of the group even during the last quarter of the eighteenth century; and his supremacy became yet more absolute afterwards, when for another generation he stood alone. In 1786 he made a journey to Italy, where he remained two years, visited Sicily, and remained a long time in Rome. This residence in Italy had the effect of still further developing his artistic powers. Here his *Iphigenia* was matured, *Egmont* finished, and *Tasso* projected. The first of these was published in 1787, the second in 1788, and the third in 1790. In the same year as *Tasso* was published the earliest form of the first part of *Faust*,



with the title *Dr. Faust, ein Trauerspiel* (Dr. Faust, a Tragedy). At the time that Goethe was engaged in the production of these works of imagination he had been pursuing various other studies of a scientific nature. The result of his studies in botany was a work published also in 1790, *Versuch die Metamorphose der Pflanzen zu Erklären*. In the following year (1791) he began to apply himself to optics, and in 1791-1792 he published a work on this subject called *Beiträge zur Optik*.

At the Weimar theatre, of which he became director in 1791, he brought out some of the dramatic *chefs-d'œuvre* of Schiller, and there, too, his own dramatic works first appeared, *Götz von Berlichingen*, *Faust*, *Iphigenia in Tauris*, *Tasso*, *Clavigo*, *Stella*, and *Count Egmont*. Between 1794 and 1796 Goethe published *Wilhelm Meisters Lehrjahre*, which had as a continuation *Wilhelm Meisters Wanderjahre* (that is, his travels as a journeyman; 1821). His next work of importance was *Hermann und Dorothea* (1797). In 1808 he published another edition of *Faust* in a considerably altered form. In 1809 was published *Wahlverwandschaften*, another novel, and in 1810 the *Farbenlehre*, a work in which he had the boldness to oppose the Newtonian theory. Between 1811 and 1814 appeared Goethe's autobiography; in 1819 the *Westöstlicher Divan*, a remarkable collection of Oriental songs and poems. Goethe's last work was the second part of *Faust*, which was completed on the evening before the last anniversary of his birthday which he lived to see.—BIBLIOGRAPHY: G. H. Lewes, *Life of Goethe*; H. G. Atkins, *Johann Wolfgang Goethe*; J. G. Robertson, *Goethe and the Twentieth Century*.

Gogol, Nikolai Vassiljevitch (1809-1852), Russian author. Among his most notable works are: *Evenings at the Farm* (1832); *Mirgorod* (1834), a collection of tales; *Dead Souls* (1842), a satirical novel, depicting the public abuses and barbarism of manners prevalent in the provinces; and *Revisor*, a comedy. His later years were tinged with religious mysticism, and he wrote some curious *Confessions*. Gogol is the father of Russian realistic literature.

Gogra, the chief river of Oudh, forming an important water-way for that quarter of India. It is a tributary of the Ganges; length, 600 miles.

Goil, Loch,, a sea-loch of Argyllshire, Scotland, the western arm of Loch Long.

Goitre, or Bronchocele, a disease known as *Derbyshire neck*, endemic in certain mountainous districts, e.g. Derbyshire and Switzerland, characterized by a morbid enlargement of the thyroid gland on the anterior part of the neck. It is due to deficiency of iodine, and can be prevented by adding iodine to the drinking-water.

Gojam, a province of Abyssinia, inhabited by Ethiopians proper.

Gökcha, a lake in Armenia, occupying a triangular cavity 540 sq. miles in extent. It has good fishing.

Golborne, an urban district in Lancashire, with cotton manufactures and a colliery. Pop. (1931), 7322.

Golcar, a manufacturing town in the West Riding of Yorkshire, on the River Colne. There is a mineral spa, and woollens are manufactured. Pop. (1931), 9812.

Golconda, a fortress and ruined city of India, in the Nizam's dominions, 7 miles west of Hyderabad. In former times Golconda was a large and powerful kingdom of the Deccan, and was famous for diamonds. Hence the name came to be used for fabulous wealth.

Gold is a precious metal of a bright-yellow colour, and the most ductile and malleable of all the metals; symbol, Au; atomic weight, 197.2. It is soluble in *aqua regia*, and in a solution of chlorine. Its specific gravity is 19.3. Gold is seldom used for any purpose in a state of perfect purity on account of its softness, but is alloyed with some other metal. Standard gold, or the alloy used for the gold coinage of Britain, consists of twenty-two parts of gold and two of copper (being thus 22 carats fine). Articles of jewellery are made of varying degrees of fineness up to 22 carats, the legal standards being 9, 12, 15, 18, and 22.

Gold has been found in smaller or larger quantities in nearly all parts of the world. It is commonly found in reefs or veins with quartz, and in alluvial deposits. Among the latter may be ranked the deposits in river beds, from which the gold is obtained by dredging. When gold is in rock, quarrying, crushing, washing, and treatment with mercury are employed. The rock is crushed by machinery, and the crushed material is treated with mercury, which dissolves the gold, forming a liquid

amalgam, after which the mercury is volatilized, and the gold left behind. Two other processes are also in use—*chlorination* and *cyaniding* (see *Cyaniding*). In alluvial (or *placer*) deposits, the gold is extracted by washing, in the form of dust, grains, laminae, or nuggets. Where practicable, the method known as 'sluicing' is often adopted for treating alluvial deposits. Where water is plentiful, 'hydraulic mining' is the cheapest mode of working. Under this system 'deep leads' and other alluvial deposits are worked by washing down the gravel by means of a powerful jet of water, a head of 200 to 250 feet being sometimes employed. In quartz mining—and the case is similar with the hard, solid 'banket' formation of South Africa that contains the gold—the ore to be crushed is first passed through a 'stone-breaker' or 'ore-crusher', and is further crushed by the 'stamps' or other grinding-mill. A stream of water is admitted, and carries the crushed material through the screens. Mercury is fed into the mortar-boxes in small quantities, and much of the gold is retained there on amalgamated copper plates.

Gold was probably the first metal to attract the attention of man, its presence in the native condition, its brilliant lustre, and its malleability rendering it an object of value from the earliest times. Although widely distributed in nature, it is only found in a few localities in sufficient quantities to repay the extraction costs. The chief producers of gold in the order of their importance are: Africa, United States, Australasia, Mexico, Russia, Canada, India, China, and South America. The total value of the gold produce of the world from 1493 to 1850 is estimated at £662,900,000. An immense increase in the world's production was caused by the discovery of gold in California in 1848 and Australia in 1851, the world production between 1851 and 1885 being estimated at £890,500,000. Since 1884 the gold-fields of South Africa have become of increasing importance, and with the exception of war years have shown a constant increase in yield year by year. The Transvaal has been mainly responsible for this increase, and since 1902 has been the greatest gold-yielding country in the world. Rhodesia and West Africa also yield much gold. In the United States the chief gold-producing states are Colorado, California, Nevada, and Alaska,

although other states also yield gold. Considerable gold-fields exist in the western portion of the North American continent, reaching from Mexico up to British Columbia and the Klondyke district. Notable fields have been discovered in Manitoba and Ontario (Red Lake). In Russia gold is abundant in the Ural Mountains; in India the most important locality is that of the Kolar gold-fields in Mysore. In China gold has long been mined in the province of Shantung. In the United Kingdom gold has been found in Cornwall, Sutherlandshire, Perthshire, Wicklow, and has been worked to some extent in Wales. In 1887 the world's production was estimated at £22,000,000; in 1907 at £83,000,000; and in 1928 at about £85,000,000.—BIBLIOGRAPHY: T. K. Rose, *Metallurgy of Gold*; J. H. Curle, *Gold Mines of the World*; T. C. Earl, *Gold Dredging*; J. Park, *The Cyanide Process of Gold Extraction*.

**Goldau**, a valley in Switzerland, in the canton of Schwyz, between the Rigi and the Rossberg.

**Gold-beating**, the art or process of producing the extremely thin leaves of gold used in gilding. The gold is cast into ingots, which are rolled into ribbons, cut into 150 pieces, and beaten between pieces of fine vellum. The leaves are then further divided, beaten between layers of gold-beaters' skin, and finally placed in paper books for use.

**Gold Coast**, a British Crown Colony in West Africa, lying between the French Ivory Coast and French Togo, and including Ashanti (annexed 1901), the protected Northern Territories, and part of Togoland (13,040 sq. miles mandated by the League of Nations); area, 91,690 sq. miles; pop. 2,296,400. The Gold Coast was settled first by Portugal and then by Dutch and English, but finally became British in 1871. The whole country, at one time a perfect death-trap, has now no terrors for the white man if ordinary health precautions are observed. The Gold Coast is the greatest cocoa-producing country in the world, the annual export being about 220,000 tons. Other exports are manganese, timber, kola, and gold. The annual value of exports is about £3,000,000. There are 400 miles of railway track, and 3800 miles of motorable roads. With the pushing of the railways beyond Kumasi to the Northern Territory, and the extension of the road system, the enormous

agricultural, forest, and mining resources of the country will become of great commercial importance. The chief towns and harbours are Accra (the capital), Cape Coast Castle, Axim, Ada, and Sekondi. At Takoradi, near Sekondi, a deep-water port for large vessels has been constructed. See *Ashanti*; *Northern Territories*; &c.—Cf. J. Maxwell, *The Gold Coast Handbook*.

**Golden-beetle**, the popular name of several beetles of the genus *Chrysomela*, few of which are British.

**Golden-crowned Wren**. See *Wren*.

**Golden Fleece**. See *Argonauts*.

**Golden Fleece**, Order of the, the *Toison d'or*, a military order instituted by Philip the Good, Duke of Burgundy, in 1430, on the occasion of his marriage with the Portuguese princess Isabella. From 1713 to 1919 the order belonged both to Austria and Spain.

**Golden Gate**, the channel connecting San Francisco Harbour with the Pacific Ocean.

**Golden Horde**, the followers of Genghis Khan, and of Batu, the grandson of Genghis Khan, who invaded Europe in the thirteenth century. They founded the empire of the Kiptshaks, or the Golden Horde, which extended from the banks of the Dniester to the Ural, and from the Black Sea and the Caspian to the mouth of the Kama and the sources of the Khoper. This empire lasted till towards the close of the fifteenth century, when it was overthrown by Tsar Ivan III.

**Golden Legend** (*Aurea Legenda*), a collection of legends of the saints made in the thirteenth century by Jacobus de Voragine, or James of Viraggio, Archbishop of Genoa (died 1298). Caxton printed a translation in 1483.

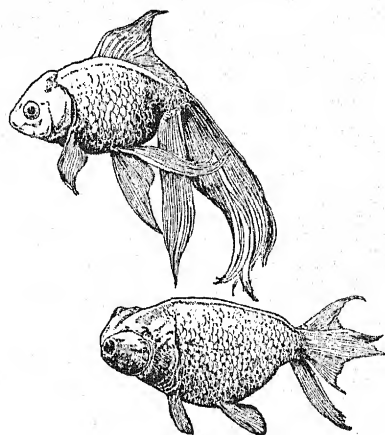
**Golden-rod** (*Solidago*) is a genus of plants, nat. ord. Compositæ, chiefly natives of North America. *S. virgaurea*, often called Aaron's Rod, is the only British species.

**Golden-saxifrage**, the popular name for plants of the genus *Chrysosplenium*, a small genus of Saxifragaceæ. There are two British species.

**Golder's Green**, a residential district of Middlesex, between Hampstead and Hendon.

**Goldfinch**, a common British bird, the *Carduelis elegans*, belonging to the Finch family. It is about 5 inches in entire length, black, scarlet, yellow, and white being beautifully mingled in its plumage.

**Goldfish**, the popular name for a beautiful species of carp (*Carassius auratus*)



Goldfish

found in the fresh waters of China and Japan. In the natural state they are green, and the typical golden-yellow of the domestic variety is obtained by artificial selection. The Chinese rear them and keep them for ornament, propagating many extraordinary varieties. In large ponds they readily revert to their original colour.

**Gold of Pleasure**, the *Camelina sativa*, a cruciferous or brassicaceous annual, with yellow flowers and pear-shaped pods, found in corn-fields in Britain. On the Continent the oil from the seeds and the fibre from the stem are of some commercial value.

**Goldoni**, Carlo (1707–1793), Italian dramatist. In 1736 he married the daughter of a notary of Genoa, and settled down in Venice. Here he first began to cultivate that department of dramatic poetry in which he was to excel; namely, description of character and manners. In this he took Molière, whom he began to study about this time, for his model. He eventually settled in Paris, and became reader and master of the Italian language to the daughters of Louis XV. Many of his numerous pieces still retain possession of the stage in his native country, and, in translations, of the stages of foreign countries. Among his best-known comedies (about 150) are: *La Donna di Garbo*.

*Pamela Nubile, Todero Brontolon, La Casa Nova, Il Vecchio Bizarro, and L'Adulatore.* —Cf. Copping, *Alferi and Goldoni: their Lives and Adventures.*

Goldschmidt, Madame. See *Lind, Jenny.*

Goldsmith, Oliver (1728–1774), Irish poet, playwright, and novelist. His father was a clergyman of the Established Church, with a large family and a small income. After leaving the village school, he went to schools at Elphin, Athlone, and Edgeworthstown. In 1744 he was admitted to Trinity College, Dublin, as a sizar, and became a B.A. in 1749. His name was last on the list. He now coquetted with each of the learned professions in turn, finally going to Edinburgh to study medicine under Alexander Monro. He remained two years in Edinburgh, and then in 1754 went to complete his studies on the Continent. A certain element of myth surrounds his adventures there. He studied at Leyden and Louvain, and went on foot through France, Germany, Switzerland, and Italy, supporting himself by playing on the flute, or by disputing with scholars at convents or universities, like the Admirable Crichton. He himself alleged that he took the M.B. degree somewhere; it has been thought it was either at Padua or Louvain; it has also been thought that he imagined the incident. Anyhow, when he landed in England on 1st Feb., 1756, he was a distinguished graduate of the world's university. He had seen many sides of life, and was destined to see many more. He became an apothecary's assistant, an usher, a reader to Richardson (the novelist and printer), and a poor physician. Finally he began to do hack-work for various publishers, commencing by writing many reviews and critiques.

Goldsmith's literary works may be divided into two classes: those which were original, and those which were compilations. As an author he had almost a dual personality, like Dr. Jekyll and Mr. Hyde. Dr. Jekyll wrote the *Inquiry into the State of Polite Learning*, the *Essays*, the *Bee*, the *Citizen of the World*, the *Vicar of Wakefield*, and the poems and plays. Mr. Hyde, meanwhile, was busy at histories of Greece, Rome, and England, and at a work on natural history entitled *Animated Nature*, as well as writing various shorter works such as the *Life of Beau Nash*, *Memoir of Voltaire*, and *Life of*

*Bolingbroke*. It is not necessary to say much of Goldsmith's compilations. Even in them he displays his beautifully easy style, his own distinct way of writing. His original works are, however, on a different plane altogether. In them he expressed his unique personality. No one ever put so much of himself into his books as Goldsmith. His longer poems *The Traveller* and *The Deserted Village* are excellent poems of a didactic kind, exquisitely expressed. His lighter poems, *The Haunch of Venison* and *Retaliation* especially, are delightful. *Retaliation* is a masterpiece of urbane satire. Of the two plays, *She Stoops to Conquer* (1773) is a good deal better than *The Good Natur'd Man* (1768). The latter is a good comedy of manners, modelled upon Goldsmith's compatriot Farquhar. *She Stoops to Conquer* is a splendid comedy of intrigue. It still holds the stage, and is as amusing to-day as when it was first produced. It did much to kill the taste for sentimental or genteel comedies, such as those of Cumberland. Some of the *Essays*, both those in the *Bee* and those not, are good, as is also the *Inquiry*. The *Citizen of the World* (1762), in which a Chinaman describes English manners and customs, contains pieces more characteristic of Goldsmith, especially in the passages describing Beau Tibbs. Goldsmith's great masterpiece, however, is *The Vicar of Wakefield*, which Johnson sold for £60 in 1762, but which did not appear until 1766. By 1886 ninety-six different editions of it had been published. Goldsmith was a friend of all the most notable literary men of his day: Johnson, Burke, Gibbon, Garrick, Boswell, and Reynolds. He was recklessly charitable when he had any money. He is said to have died £2000 in debt, and his financial troubles hastened his end.—BIBLIOGRAPHY: J. Forster, *Life and Adventures of Oliver Goldsmith*; Sir James Prior, *Life of Oliver Goldsmith*; Austin Dobson, *Life of Goldsmith* (Great Writers Series); W. Black, *Goldsmith* (English Men of Letters Series).

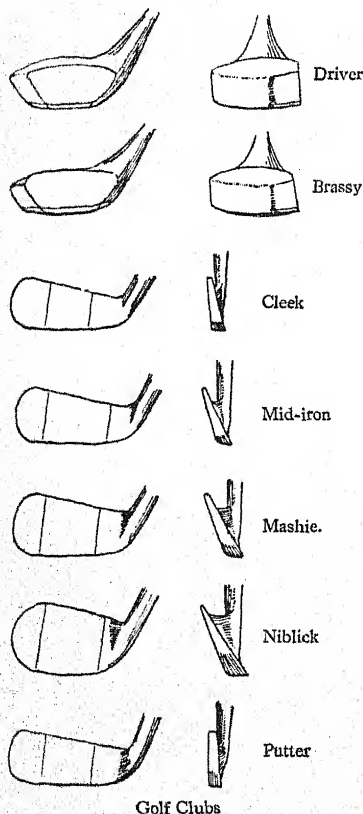
Golf, a game played with clubs and balls over large commons, downs, or links. It is said to have originated in Holland, and the word golf itself is doubtfully derived from the Dutch *kolf*, a club. It has been played in Scotland for centuries, but it was not till the middle of the nineteenth century that the game really began to



take root in England. The Royal and Ancient Club of St. Andrews (founded in 1754) is now the recognized head-quarters of the game in the United Kingdom, and all the members of the Rules of Golf Committee belong to this club. Other well-known golf-courses or links are at

and with a fair supply of gorse, constitute ideal conditions. But often the worst natural disadvantages are overcome by skilled artificial additions. The varying nature of the ground on a golf-course, and the different obstacles to be surmounted, necessitate the use of a number of different clubs. The chief clubs are the *driver*, *brassy*, *cleek*, *mashie*, *iron*, *niblick*, and *putter*. Of these the first two have wooden heads, the rest iron, though the putter is often made of aluminium. The heads of wooden clubs are made of beech, persimmon, or logwood, and weighted with lead behind. The shafts are usually of hickory. The *driver*, the club used for the drive from the 'teeing-ground', is a long club, and has an exceedingly supple shaft. The *brassy* is a somewhat similar club, but is shorter, less springy, and is shod with a brass plate. Its face is laid back somewhat, so as to 'loft' the ball, and it is used in fairly good 'lies' on grass. The *cleek*, an iron club with a flat face, is used for a long shot from a good lie where a wooden club cannot be used. Both the *mashie* and the *iron* are used for lofting the ball out of bunkers or over obstacles, or for short 'approaches' to a putting-green, and accordingly have their faces laid back. The *niblick* has a very short spoon-shaped head, and serves to extricate the ball from deep sand, small holes, cart-ruts, &c. The *putter* is used on the 'putting-green' for putting the ball into the hole from short distances. There are other kinds of clubs, but as a rule these have been evolved from one of the standard classes. The ball, which was originally of feathers covered with leather, was afterwards always made of gutta-percha, and now usually consists of a core round which india-rubber thread is wound, the whole being cased with gutta-percha. No ball may be heavier than 1.62 ounces or smaller in diameter than 1.62 inches.

A golf-course of full size is divided into eighteen sections by a series of small round holes,  $4\frac{1}{4}$  inches in diameter, sunk in the turf at distances of from 100 to 500 yards from each other, so as to form a circuit or round; many courses have only nine holes. Round each hole a grass-grown space, known as the putting-green, is kept perfectly smooth. The object of the game is, starting from the first teeing-ground (or place from which the



Prestwick, Gales, Turnberry, Gleneagles, and North Berwick, in Scotland; Westward Ho, Hoylake, and Sandwich, in England; and Portrush, in Ireland. Golf-courses are found all over the world, and the game has been taken up with exceptional keenness in the U.S.A.

The best courses are at sea-level, where sandy soil, covered with short turf and provided with natural sandy 'bunkers'

balls are driven off towards each hole), to drive the ball into the next hole in as few strokes as possible, and so on with all the holes in succession, the side which 'holes out' on any occasion in the fewest strokes being said to win the hole. The match is decided either by the greatest number of holes won, or by the aggregate number of strokes for the whole round. In medal play, and in some championships, the score is always reckoned by strokes. Often what are known as 'Bogey' competitions are held. 'Colonel Bogey', who is a kind of 'Mrs. Harris' of golf, has a fixed score allotted to him for each hole, this score being approximately that of a good player who accomplishes the round without making any bad blunders. Ordinarily the ball may not be touched otherwise than with the club during the game, except to take it out of the hole and place it in position on the teeing-ground (the 'tee' being a little mound of sand, on which the ball is placed for the first drive to each hole). General and local rules, however, recognize certain unplayable positions from which a ball may be lifted with or without penalty. A certain number of annual golf fixtures are held. Of these the most important are the British Open Championship, the British Amateur Championship, the British Boys' Championship, and the Ladies' Open Championship.—BIBLIOGRAPHY: H. G. Hutchinson, *Golf Greens and Green Keeping*; *The New Book of Golf*; H. Hilton and G. G. Smith, *The Ancient and Royal Game of Golf*. See also *The Golfer's Annual* and *The Golfer's Year-Book*.

Goliath-beetle, the popular name of the beetles of the genus *Goliathus*, natives of tropical Africa. The largest species (*G. druryi*) attains the length of 4 inches.

Goltz, Baron Colmar von der (1843–1916), German soldier and author. In 1883 he went to Turkey for the purpose of reorganizing the Turkish army, and remained there until 1895. In 1908 he went again to Constantinople, where he was instrumental in furthering the Young Turk movement. During the European War he was Governor of Brussels from Sept. to Oct., 1914, and afterwards Governor of Belgium. In 1915 von der Goltz again went to Turkey, where he supervised the defences of the Dardanelles and the Turkish operations against the Allies. His works include: *Gambetta and*

*his Armies* (1877), *The Nation in Arms* (1883), and *The War History of Germany in the Nineteenth Century*.

Gomara, a district in the south-west of Abyssinia, noted for its coffee.

Gomarites, or Gomarists, followers of Francis Gomarus (1563–1641), a Dutch disciple of Calvin. The sect very strongly opposed the doctrines of Arminius.

Gomel, a province of White Russia. The town Gomel has railway repair works and sugar- and oil-refineries. Pop. 37,000.

Gomera, one of the Canary Islands, having an area of 143 sq. miles and a population of 19,736. It is wooded and very fertile. Silk is manufactured. The chief town is San Sebastian.

Gomersal, a town in the West Riding of Yorkshire, England, with several collieries, worsted-mills, and manufactures of blankets and cloth. Pop. 3796.

Gomez, Sebastiano (1646–1690), Spanish painter. He was originally a slave of Murillo, but became one of his pupils.

Gompers, Samuel (1850–1924), American labour leader. He was one of the founders of the American Federation of Labour, and became its president in 1881. When America entered the European War, Gompers used his influence in support of the Allied cause, opposing not only communist ideas as introduced into Russia by the Soviets, but also socialism. A labour leader, Gompers nevertheless always remained a staunch supporter of the capitalist régime. He was president of the International Labour Conference at Washington in 1919. His works include: *The American Labor Movement* and *American Labor and the War*.

Gomperz, Theodor (1832–1912), Austrian philologist and classical scholar. He is well known for his decipherment of the papyri of Herculaneum. His works include: *Herculaneische Studien*, *Beiträge zur Kritik und Erklärung der Griechischen Schriftsteller*, *Platonische Aufsätze*, and *Griechische Denker*.

Gomul Pass, a pass across the Sulaiman range, from the Punjab into Afghanistan. It follows the course of the Gomul River, and is an important trading highway.

Gonaïves, a town on the west coast of Haiti, on the bay of the same name. It has an excellent harbour. The exports are cotton, coffee, salt, and mahogany. Pop. 10,000.

Goncharov, Ivan Alexandrovitch (1812-1891), Russian novelist. His first novel, *A Common Story*, appeared in 1847, and his master-work, *Oblomov*, in 1857.

Goncourt, Edmond (1822-1896) and Jules de (1830-1870), French novelists and writers on social history. Their historical and biographical works dealt chiefly with the eighteenth century, and especially the period of the Revolution. Their works include: *Portraits Intimes du XVIII<sup>e</sup> Siècle* and *L'Art du XVIII<sup>e</sup> Siècle*.

Gonda, the chief town of district of the same name, Oudh, India. Pop. 17,400. —The district has an area of 2881 sq. miles. Pop. about 1,500,000. Great crops of rice, wheat, and maize are raised.

Gondar, a town of Abyssinia, formerly the residence of the king, and still the ecclesiastical head-quarters, situated about 22 miles north of Lake Dembea. Pop. 3000.

Gondokoro, a port on the Upper Nile, in Uganda, at the head of steamer navigation. There is a trade in ivory.

Gondola, a sort of barge, navigated on the canals of Venice. The ordinary gondolas are upwards of 30 feet long and 4 feet broad; they always terminate at each end in a very sharp point, which is raised perpendicularly to the height of a man. Towards the centre there is a curtained chamber for passengers.

Gonds, a Dravidian people, the aboriginal inhabitants of the old territorial division of India called Gondwana, corresponding pretty nearly to what is now called the Central Provinces. Their numbers have been variously estimated up to 2,000,000, partly under feudatory states and partly under the British Government, in the Central Provinces.—Cf. S. Hislop, *Papers relating to the Aboriginal Tribes of the Central Provinces*.

Gongora y Argote, Luis de (1561-1627), Spanish poet. His works consist chiefly of lyrical poems, in which he excelled. He introduced a new poetic phraseology called the *estilo culto*, and founded a school of writers, the *Gongoristas*, who carried this depraved style to an absurd length.

Goniatites, an extinct group of shell-bearing cephalopods, now divided into many genera, such as *Glyphioceras*, *Gastrioceras*, &c., and ranging from the Ordovician to the Carboniferous system.

Goniometer, an instrument for measur-

ing solid angles, particularly the angles formed by the faces of crystals. The *reflecting goniometer* is an instrument of this kind for measuring the angles of crystals by determining through what angular space the crystal must be turned so that a ray reflected from two faces successively shall have the same direction. The angle of rotation is the supplement of that between the faces.

Gonorrhœa is a specific contagious disease due to an organism called the gonococcus, and the usual means of spread of the infection is sexual intercourse. The disease, when treatment is neglected, especially in women, may have most far-reaching and devastating effects. The acute stage lasts from ten days to three weeks.

Gonsalvo, Hernandez y Aguilar, de Cordoba (1453-1515), Spanish soldier. In 1495 he was sent to assist Ferdinand II, King of Naples, against the French, who occupied the whole of that kingdom. In less than a year Gonsalvo drove the French over the Neapolitan frontiers. By the victory near Seminara in 1502 he obtained possession of both Calabrias. In 1503 he gained a still more important victory near Cerignola. He defeated the Marquis of Mantua; and on the Garigliano, with 8000 men, obtained a complete victory over 30,000 French, the consequence of which was the fall of Gaëta. The possession of Naples was now secured. He was Viceroy in Italy until 1507.

Good Friday, a fast of the Christian Church in memory of our Saviour's crucifixion, kept on the Friday of Passion Week, that is, the Friday before Easter. It has been celebrated from a very early period. In the Roman Catholic Church the celebration of this fast includes the 'Adoration of the Cross', but no mass is celebrated.

Good King Henry. See *Goosefoot*.

Goodrich, Samuel Griswold (1793-1860), American author. He is best known as 'Peter Parley', a pseudonym which he assumed in writing, editing, and compiling upwards of 100 children's books. He also wrote: *Recollections of a Lifetime*, *Sketches from a Student's Window*, *A History of all Nations*, *The Outcast and other Poems*, and *An Illustrated History of the Animal Kingdom*.

Good Templars, a temperance brotherhood which combines the principles of

teetotalism with certain mystic rites, imitated less or more from freemasonry, having secret signs, passwords, and insignia peculiar to itself. It originated in New York in 1851, and extended to Britain in 1868.

**Goodwill**, a term applied to certain advantages which may attach to and pass with a business. It has been variously defined as "the probability that the old customers will resort to the old place", "the attractive force which brings in custom", or "the benefit arising from connexion and reputation". Goodwill is an asset distinct from the physical assets such as buildings, stock, or cash. Not infrequently it is the most valuable asset of a business. It has, therefore, a monetary value, and is capable of sale or transfer. Such a disposal of goodwill carries with it (in the absence of contrary agreement) the exclusive use of the trade name and the sole right to canvass the former customers. The trade-mark is transmitted with it, and *ad valorem* stamp duty is leviable. Its value must also be ascertained for payment of death duties.

**Goodwin Sands**, certain dangerous sand-banks about 4 or 5 miles off the east coast of Kent, the intervening channel forming the well-known roadstead called the Downs. Their entire length, north to south, is about 10 miles; breadth, varying from  $1\frac{1}{2}$  miles to 3 miles; and in many places they are dry at low water. This shoal has four lightships for the guidance of mariners.

**Goole**, a river-port, England, county of York (West Riding), on the Ouse, 23 miles west by south of Hull. The town has a good shipping trade. Besides the tidal basin, a series of large and commodious docks has been constructed, and there is accommodation for vessels drawing 17 to  $18\frac{1}{2}$  feet. The exports are mostly coal, machinery, and woollen goods. Ship- and boat-building, sail-making, iron-founding, artificial manure and agricultural machine-making are carried on. Pop. (urban district) (1931), 20,238.

**Goosander**. See *Merganser*.

**Goose**, the common name of the birds belonging to a sub-division (*Anserinæ*) of the duck family. Among the most common species are the Wild Goose (*Anser cinereus*), a migratory bird; the North American Snow Goose (*Chen hyperboreus*), a large bird with a very curious bill; the Laugh-

ing Goose (*Anser albifrons*); the Bean Goose (*A. segetum*); the Canada Goose (*Bernicla Canadensis*); Bernacle Goose (*B. leucopsis*); Brent Goose (*B. branta*); and the Red-breasted Goose (*B. ruficollis*).

**Gooseberry** (*Ribes grossularia*), a low, branching shrub, growing wild in Siberia and the north of Europe, other species being found in North America. Along with the currants it forms the order Grossulariaceæ, which is now usually combined with Saxifragaceæ. The fruit is a succulent berry, very wholesome and agreeable, and is popular for preserving. The gooseberry plant is easily grown. It is usually raised from slips; new varieties from seed. Four-year-old plants yield the biggest berry; afterwards the fruit becomes smaller but increases in quantity.

**Goosefoot** (*Chenopodium*) is a genus of plants, common in waste places, with small greenish flowers. Several species are found in Britain. *C. Bonus-Henricus*, English mercury, or Good King Henry, is a substitute for spinage. The seeds of *C. quinoa* of Peru are used as food.

**Gopher**, the name of various North American animals: (1) the pouched rat or pocket gopher; (2) the ground or prairie squirrel, genus *Spermophilus*, found on the prairies; (3) the burrowing land tortoise (*Testudo polyphemus*) of the Southern States, valued for its eggs.

**Göppingen**, a town of Württemberg, Germany. It has a mineral spring, and manufactures of woollen and linen cloths, hats, and paper. Pop. (1925), 22,017.

**Gorakhpur**, a town of India, United Provinces of Agra and Oudh, capital of the division and district of same name, on the left bank of the Rapti. It has a considerable trade in grain and timber, sent down the Rapti to the Gogra and the Ganges. Pop. 56,890.—The division has an area of 9543 sq. miles; pop. 6,524,420.

**Gordianus**, M. Antonius, the name of three Roman emperors, father, son, and grandson. The first (158–238) was proclaimed emperor at the age of eighty. He associated his son (192–238) with him in the empire, but six weeks later the son was killed in fighting against the rival emperor, Maximinus, and the father, in an agony of grief, died by his own hand. The grandson (224–244) was proclaimed emperor by the soldiers, and reigned six years.

**Gordius**, in Greek legend, a Phrygian



peasant who was raised to the Phrygian throne in accordance with an oracle. To evince his gratitude he dedicated his chariot to Zeus, and fastened the pole with so ingenious a knot that the oracle promised the dominion of the world to him who should untie it. Alexander the Great cut it with his sword, and to 'cut the Gordian knot' became a proverb.

**Gordon, Adam Lindsey** (1833-1870), Australian poet. His first volume of poems, *Sea Spray and Smoke Drift* (1867), met with a very favourable reception, as did also *Bush Ballads and Galloping Rhymes* (1870), which depicted bush life with marvellous fidelity. He committed suicide the same year. He also wrote *Ashtaroth: a Dramatic Lyric*.

**Gordon, Charles George** (1833-1885), British soldier. He entered the Royal Engineers in 1852, and served in the Crimea (1854). During the Taiping Rebellion in China, Gordon succeeded in completely crushing the revolt by means of a specially-trained corps of Chinese. From 1874 to 1879 he was Governor of the Sudan under the Khedive. In 1884 he was sent to withdraw the garrison shut up in the Sudan by the insurgent Mahdi. He was shut up in Khartoum by the rebels, and gallantly held that town for ten months. A British expeditionary force under Lord Wolseley was dispatched for his relief; an advance corps sighted Khartoum on 24th Jan., 1885, to find that the town had been treacherously betrayed into the hands of the Mahdi two days before, and Gordon murdered.—**BIBLIOGRAPHY:** D. C. Boulger, *Life of Gordon*; Lytton Strachey, *Eminent Victorians*.

**Gordon, Family of**, a celebrated Scottish historical House. It is probable that the family came over to England with William the Conqueror. The direct male line died out in the person of Sir Adam of Gordon, who fell in the battle of Homildon (1402), but from his female and illegitimate descendants a number of branches sprang up. His grandson was made Earl of Huntly (1445). The head of this branch was made marquess in 1599, and Duke of Gordon in 1684. The dukedom became extinct in 1836. The Barons Lochinvar, the Viscounts Kenmure, and the Earls of Aberdeen are (or were) all branches of the Gordon family.

**Gordon, Lord George** (1751-1793), son of Cosmo George, Duke of Gordon. A Bill

having been introduced into the House for the relief of Roman Catholics from certain penalties and disabilities, in June, 1780, Lord George headed an excited mob of about 100,000 persons, who went in procession to the House of Commons to present a petition against the measure. The dreadful riots, known as the 'No Popery' Riots, which ensued led to his arrest and trial on the charge of high treason; but, no evidence being adduced of treasonable design, he was acquitted.

**Gordon, Sir John Watson** (1788-1864), Scottish painter. He applied himself almost exclusively to portrait-painting, in which he attained great excellence.

**Gordon, Patrick** (1635-1699), Scottish soldier. In 1661 he entered the Russian service, became a general, and rose high in favour with Peter the Great. He kept a diary, passages from which were edited for the Spalding Club in 1859.

**Gore, Catherine Grace** (1799-1861), English novelist. She wrote altogether from sixty to seventy novels, clever pictures of fashionable life, among the best of which are: *Cecil, or the Adventures of a Coxcomb*; *The Hamiltons*; *The Banker's Wife*; *Pin Money*; *Peers and Parvenues*; and *Temptation and Atonement*.

**Gorée**, a small island, belonging to France, on the coast of Africa, south-east of Cape Verde. There is a small harbour, and ivory and wax are exported. Pop. 1444.

**Gorgias** (c. 483-375 B.C.), Greek orator and sophist. He was a popular teacher of rhetoric, had many distinguished pupils, and is protagonist in the *Gorgias* of Plato. Two works attributed to him are extant, *The Apology of Palamedes* and *The Encomium on Helena*, but their genuineness has been questioned.

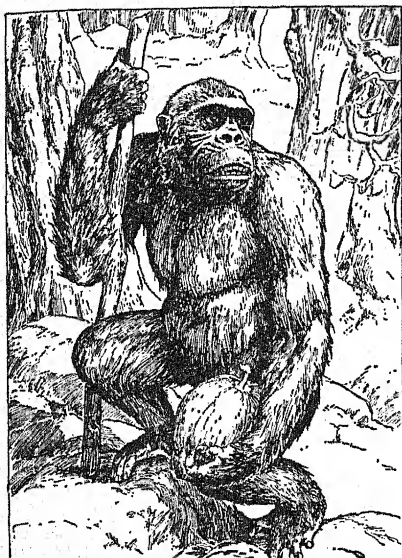
**Gorgons**, in Greek mythology, three monsters whose names were Stheno, Euryale, and Medusa, daughters of Phorcys and Ceto. Their hair was said to be entwined with serpents, their hands were of brass, and they turned to stones all those who looked upon them. Medusa was killed by Perseus (q.v.), and her head was afterwards placed on the *Ægis* of Athena.

**Gorgonzola**, a town and commune, Italy, 12 miles E.N.E. of Milan. It has a trade in a kind of ewe-milk cheese. Pop. 5190.

**Gori**, a town of Georgia, Transcaucasia, 40 miles north-west of Tiflis. It is the

centre of an agricultural area, and has manufactures of cottons and woollens. Pop. 11,000.

**Gorilla** (*Gorilla gorilla*), the largest animal of the ape kind. It attains a height



Gorilla (*Gorilla gorilla*)

of about 5½ feet or more, is found chiefly in the woody equatorial regions of Western Africa, is possessed of great strength and fierceness, is a great frequenter of trees, and feeds chiefly on vegetable substances, as roots and fruits. The erect position is more readily assumed by the gorilla than by most of the other anthropoid apes. The gorilla, like the chimpanzee, has thirteen ribs, whereas man and the orang have twelve. The bones of the arm are much longer than in man, and the leg bones are shorter.

**Gorinchem** (*Gorkum*), a fortified town of the Netherlands, on the Linge, at its junction with the Merwede. It has a good harbour, exports cereals and hemp, and has excellent salmon fisheries. There is canal communication with Amsterdam. Pop. 12,058.

**Goring**, a village on the Thames, in Oxfordshire. It is a boating centre. Pop. (1931), 3391 (rural district).

**Gorizia**, a town of Italy, 23 miles N.W. of Trieste, formerly belonging to Austria-Hungary. There are cotton- and silk-weaving mills, and leather, liqueurs, pottery, and soap are manufactured. Pop. 31,000.

**Gorky** (pseudonym of *Alexei Maximovich Pyeshkov*) (1868— ), Russian author. He travelled over a large part of his native country as a tramp and mixed with the lowest of the population. The varied scenes and persons which he saw in this his vagabond life furnished him with the material for his literary work. Among his works are: *Foma Gordyeev* (1889); *Mushik* (1900); *Three of Them* (1902); *Malva, Mother* (1907); *The Spy* (1908); and *A Confession* (1910). His play *The Lower Depths* was produced in London in 1903.—Cf. E. J. Dillon, *Maxim Gorky: his Life and Writings*.

**Görlitz**, a town of Prussia, province of Silesia, on the left bank of the Neisse. Its industries include woollens, linens, and cottons, machinery, iron-founding, glass, porcelain, leather, and soap. Pop. 80,382.

**Goroblagodat**, a mining district in the Ural Mountains, 130 miles north-east of Perm.

**Gorski**, a former republic of the Russian Socialist Federation of Soviet Republics. It was sometimes known as the *Mountain Republic*, and included the autonomous regions of *Chechensk*, *Kabarda*, &c. It was situated at the foothills of the Caucasus along the River Terek. The capital of Gorski is Vladikavkaz, and of Chechensk is Grozni. The republic is now incorporated in the North Caucasian Region. See *Russia* (table).

**Gorst**, Sir John Eldon (1835–1916), British politician. He entered the House of Commons in 1866 for the borough of Cambridge. He afterwards sat for Chatham and for Cambridge University (1892–1906). He was in succession Solicitor-General, Under-Secretary for India, Financial Secretary to the Treasury, and vice-president of the Committee of the Council on Education.

**Gorton**, a district in Lancashire, now included in Manchester. One of the Manchester water-reservoirs is at Gorton.

**Gortschakov**, Alexander Michaelovitch (1798–1883), Russian diplomatist. In 1856 he became Minister of Foreign Affairs, and in 1862 Chancellor of the Empire. He was a prominent member of the Berlin Congress, 1878.

**Gortschakov**, Prince Michael (1792–1861), Russian general. He took a prominent part in the Turkish War (1828–1829), the Polish War (1831), and the invasion of Hungary (1849). In the Crimea he held the command in Sebastopol during the siege.

**Goschen**, George Joachim, Viscount (1831–1907), British politician and financier, of German extraction. In 1868 he became President of the Poor Law Board, and subsequently First Lord of the Admiralty. When in 1886 Gladstone launched his Home Rule scheme for Ireland, Goschen became one of the leaders of the Liberal-Unionists. The same year he succeeded Lord R. Churchill as Chancellor of the Exchequer, and in 1895 he again took office as First Lord of the Admiralty. He was author of a well-known work on the *Theory of Foreign Exchanges*.

**Gosforth**, an urban district of England, in Northumberland, 2½ miles north of Newcastle, with many residences of Newcastle merchants. Pop. (1931), 18,042.

**Goshawk**, a diurnal bird of prey of the hawk kind, belonging to the genus *Astur* (*A. palumbarius*). Its general colour is brown with white on its belly and breast. The female is about 2 feet long, and the male is smaller.

**Goslar**, a town of Prussia, in Hanover, 26 miles south-east of Hildesheim, on the north side of the Harz, at the foot of the Rammelsberg. It once ranked as a free imperial city. The inhabitants are chiefly engaged in the copper, silver, and other mines in the neighbourhood. Pop. 18,900.

**Gospels**, the historical accounts which record the facts that constitute the basis of Christianity. It may be fairly said that the genuineness of the four narratives written by Matthew, Mark, Luke, and John rests upon better evidence than that of any other ancient writings. They were all composed in the latter half of the first century; those of Matthew and Mark some years before the destruction of Jerusalem; that of Luke about the year 64; and that of St. John about the close of the century. According to a widely accepted view the Gospel of St. Mark, if not the oldest in composition, is yet probably the most direct and primitive in form; it is the testimony delivered by Peter, possibly with little alteration. The Gospels of Matthew and Luke, again, "represent

the two great types of recension to which it may be supposed that the simple narrative was subjected. Luke represents the Hellenic, and Matthew the later Hebraic form of the tradition, and in its present shape the latter seems to give the last authentic record of the primitive Gospel."

A comparison of the three synoptical Gospels (those of Matthew, Mark, and Luke) yields some interesting results. If we suppose the history they contain to be divided into sections, in forty-two of these all the three narratives coincide; twelve more are given by Matthew and Mark only, five by Mark and Luke only, and fourteen by Matthew and Luke. To these must be added five peculiar to Matthew, two to Mark, and nine to Luke. But this applies only to general coincidence as to the facts narrated; the number of passages either verbally the same, or coinciding in the use of many of the same words, is much smaller. Briefly stated, the critical result is as follows: There is a singular coincidence in substance in the three synoptical Gospels. The verbal and material agreement is such as does not occur in any other authors who have written independently of one another. Several biographies of Jesus and the holy family written by unknown authors of the second, third, and later centuries are known as *Apocryphal Gospels*. They have no historical nor doctrinal value whatever.—**BIBLIOGRAPHY:** B. F. Westcott, *Introduction to the Study of the Gospels*; F. C. Burkitt, *The Gospel History and its Transmission*.

**Gosport**, a fortified seaport, England, county of Hants, on the west side of the entrance to Portsmouth harbour. Besides containing infantry barracks, it is an important naval depot, including a victualling yard, large Government factories, and Haslar Hospital. Pop. (municipal borough) (1931), 37,928.

**Gossamer** is the name of a fine filmy substance, like cobweb, which is seen to float in the air in clear days in autumn, and to a less extent in spring, and is most observable in stubble-fields, and upon furze and other low bushes. This is formed by young spiders of many species as a means of migration.

**Gosse**, Sir Edmund (1849–1928), English author, son of Philip Henry Gosse. He was translator to the Board of Trade from 1875 to 1904, and librarian to the

House of Lords from 1904 to 1914. His works include: *History of Eighteenth Century Literature*, *History of Modern English Literature*, *Collected Essays*, *The Life of Swinburne*, *Inter Arma*, *Three French Moralists*, *Diversions of a Man of Letters*, *Malherbe*, *Books on the Table*, and *More Books on the Table*.

Gosse, Philip Henry (1810–1888), English naturalist. Among his many works are: *The Canadian Naturalist*, *The Birds of Jamaica*, *A Naturalist's Sojourn in Jamaica*, *The Aquarium*, *Marine Zoology*, *Life*, *Actinologia Britannica*, *Romance of Natural History*, besides many contributions to the publications of learned societies.

*Gossypium*. See *Cotton*.

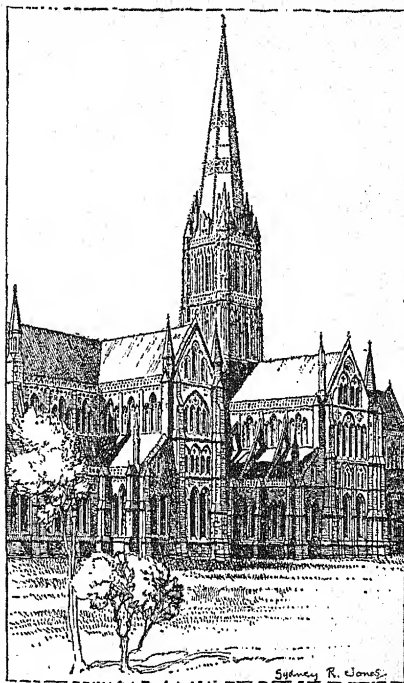
Göteborg, the chief seaport and the second largest city in Sweden. It stands on the south-west coast, and has railway and canal connexion with all parts of the country. There are shipbuilding yards, flour-mills, sugar-refineries, and numerous other industries. The chief exports are iron ores, wood-pulp, paper, grain, matches, soap, &c. The harbour, which is rarely frozen, can accommodate vessels drawing up to 29 feet, and has various graving and floating docks, and all facilities for working coal and cargo. Pop. 228,258. Under the Göteborg System of licensing reform the public-house licences are granted to a company, which, after paying expenses of management and a dividend of 6 per cent per annum, makes over the surplus profits to the town treasury. This system has been in force since 1865, and has been adopted with variations by several North European countries.—The *län* of Göteborg has an area of 1948 sq. miles, and a population of 432,285.

Gotha, a town of Germany, situated in the Thuringian Republic. It is situated on the Leine, 14 miles w.s.w. of Erfurt. The manufactures consist chiefly of woollen, linen, and cotton tissues, porcelain, musical instruments, and articles in gold and silver. Pop. (1925), 45,780.—The district of *Gotha* has an area of 385 sq. miles, and a population of (1925) 104,178.

Gotham, a parish and village in county Nottingham. It has an old reputation for folly, and the stories told of the 'wise men of Gotham' are widespread.

Gothic Architecture, a term applied to the various styles of Pointed architecture prevalent in Western Europe from the middle of the twelfth century to the revival

of Classic architecture in the sixteenth. The chief characteristics of Gothic archi-



Gothic Architecture. Salisbury Cathedral

ture are the predominance of the pointed arch and the subserviency and subordination of all the other parts to this chief feature. This style originated in France, and spread very rapidly to England, Germany, Italy, Spain, and the Scandinavian countries. In England it was introduced by William of Sens, who built Canterbury Cathedral in 1174, and here followed an independent course of development. The Gothic architecture of Britain has been divided into four principal epochs—the Early English, or general style of the thirteenth century; the Decorated, or style of the fourteenth century; the Perpendicular, practised during the fifteenth and early part of the sixteenth century (Flamboyant being the contemporary style in France); and the Tudor, or general style of the



sixteenth century (see articles on these styles). From that time Gothic architecture declined in Britain, but a revival set in about 1825.—Cf. F. Bond, *Gothic Architecture in England*.

**Goths**, an ancient Germanic tribe occupying, when first known to history, the region adjacent to the Black Sea north of the Lower Danube. About the middle of the third century A.D. they began to encroach on the Roman Empire, but in 269 they were defeated with great slaughter by the Emperor Claudius. His successor Aurelian was, notwithstanding, compelled to cede to them the large province of Dacia. In the fourth century the great Gothic kingdom extended from the Don to the Theiss, and from the Black Sea to the Vistula and the Baltic. About the year 369 internal commotions produced the division of the Gothic kingdom into the kingdom of the Ostrogoths (eastern Goths) and the kingdom of the Visigoths (western Goths). Alaric, King of the Visigoths, invaded Italy and sacked Rome in 409, and a second time in 410. After his death (in 410) the Visigoths succeeded in establishing a new kingdom in the southern parts of Gaul and Spain. The last king, Roderick, died in 711 in battle against the Moors, who had crossed from Africa and subsequently conquered the Gothic kingdom. Theodoric, King of the Ostrogoths, became King of Italy in 493, and laid the foundation of a new Ostrogothic kingdom, which came to an end in 554. Subsequently the Goths both here and in Spain entirely disappeared as a distinct people. The introduction of Christianity among the Goths, and the circumstances of their dwelling near, and even among, civilized subjects of the Roman Empire, greatly contributed to raising them in civilization above the other German tribes. Bishop Ulfilas (q.v.) in the fourth century translated, if not the whole, at least the greater part of the Bible into Moeso-Gothic. The Gothic language is richer in inflections than any other of the Teutonic tongues.—**BIBLIOGRAPHY:** E. Gibbon, *Decline and Fall*; T. Hodgkin, *Italy and her Invaders*; Prof. Skeat, *Moeso-Gothic Glossary*.

**Goto**, a group of islands off the southwestern extremity of Japan, 60 miles west of Nagasaki. The largest, Fukai, is 25 miles in length.

**Göttingen**, a town of Prussia, province

of Hanover, on the Leine. Its chief attraction is the university, founded in 1734 by George II of England and Elector of Hanover. The manufactures comprise woollens, chemicals, and scientific instruments, and Göttingen is also a publishing centre. Pop. 37,594.

**Gottland**, an island of the Baltic, belonging to and about 45 miles east of the coast of Sweden. It is of irregular shape, and has an area of 1176 sq. miles. The coast is for the most part rocky and deeply indented. The soil is fertile. The chief town is Visby. Together with two adjacent islets, the Island of Gottland forms the Swedish *län* or government of the same name. Area of *län*, 1220 sq. miles; pop. 56,457.

**Gottsched**, Johann Christoph (1700–1766), German writer. For many years he was dictator in Germany in matters of literary taste. In 1728 he published the first sketch of his *Rhetoric*, and in 1729 his *Kritische Dichtkunst* (Critical Art of Poetry). In 1730 he published his *Contributions towards a Critical History of the German Language, Poetry, and Eloquence*, and subsequently his *Erste Gründe der Weltweisheit* (First Principles of Philosophy).

**Gouda**, a town of Holland, in the province of South Holland, 11 miles north-east of Rotterdam. The great market-place is the largest in Holland. The church of St. John (1485) is noted for its organ and its painted glass windows, said to be among the finest in Europe. There are pipe-works, potteries, and breweries, and manufactories of stearine candles, yarn, and cigars. Gouda is a great market for cheese. Pop. 26,980.

**Goudimel**, Claude (1510–1572), French musical composer. Palestrina was one of his pupils at Rome. His most important work is a setting of the French version of the *Psalms* by Marot and Beza.

**Gough**, Sir Hubert de la Poer (1870–), British soldier. He joined the 16th Lancers in 1889. During the European War he held many responsible positions, being in command of the Fifth Army at the Third Battle of Ypres (July, 1917), and during the German advance at St. Quentin in March, 1918.

**Gough**, Hugh, Viscount (1779–1869), British soldier. He served in Spain from 1809 to 1813, and was sent to India as commander of the Mysore division of the

army in 1837. He commanded the land forces in the Chinese War of 1841, and returned to India as commander-in-chief. He suppressed the revolt of the Mahrattas in 1843, commanded in the Sikh Wars of 1845-1848, but was superseded by Sir Charles Napier in 1849.

**Gough's Island**, or **Diego Alvarez**, a small island in the South Atlantic, belonging to the Tristan da Cunha Group. Area 40 sq. miles.

**Goulburn**, a city of New South Wales, 134 miles south-west of Sydney. Being the centre of several important railways, it is the principal depot of the southern inland trade. Silver, copper, marble, and slate are found in the vicinity, and there are tanneries, flour-mills, breweries, and boot and shoe factories. Pop. 11,730.

**Gounod**, Charles François (1818-1893), French operatic composer. His first important work was *Faust* (1859), which raised him to a high rank among composers. Other operas followed, among which are *Mireille* (1864), *Roméo et Juliette*, *Cinq-Mars* (1877), and *Polyeucte* (1878). He wrote also a *Messe Solennelle*, a motet *Gallia*, and other choral works and songs.

**Gourd**, the popular name for the species of Cucurbita. The *C. Pepo*, or pumpkin, acquires sometimes a diameter of 2 feet. The *C. Melopepo*, or squash, is cultivated in America as an article of food.

**Gourock**, a burgh of Renfrewshire, Scotland, on the Firth of Clyde. It is a watering-place and yachting station, and a busy port of call for river steamers, being one of the principal piers of the L.M.S. Railway. Pop. (1931), 8844.

**Gout**, a form of arthritis, a constitutional disorder giving rise to paroxysms of acute pain with a specific form of inflammation, to which men are more subject than women. It generally attacks the first joint of the big toe, and the spasms become more acute at night. Disorders of the digestive and other internal organs are the usual accompaniments. If acquired, it seldom appears before thirty-five; if inherited, it comes earlier. An excess of uric acid in the blood is behind the other characteristics, and this condition is generally caused by inactivity, too free use of tartareous wines, fermented liquors, and very highly-seasoned and nitrogenous food. Gout in the feet is called *podagra*; in the knees, *gonagra*; in the hands, *chiragra*.

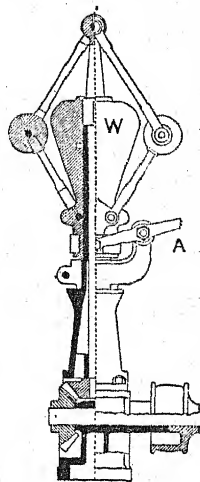
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**Govan**, a burgh of Scotland, county of Lanark, on the left bank of the Clyde, to the west of Glasgow, with which it has been incorporated since 1912. It carries on shipbuilding and engineering.

**Governor**, in engineering, a device for controlling the admission of steam to an engine or turbine. A

Porter governor is shown in the diagram. The balls are controlled by the conical cast-iron weight *w*. When the engine speed rises, the increased centrifugal force acting on the balls throws them outwards against the weight *w*. They therefore lift up the end of the rod *A*, which operates the admission-valve.—BIBLIOGRAPHY: D. A. Low, *Applied Mechanics*; H. M. Martin, *Steam Turbines*.

**Gower**, John (c. 1330-1408), English poet. He is believed to have been of good family and independent means. He was a personal friend of Chaucer, who dedicated *Troilus and Criseide* to "moral Gower". He is chiefly known on account of his three poems, *Speculum Meditantis*, written in French; *Vox Clamantis*, written in Latin; and *Confessio Amantis*, written in English. Gower, like Cerberus, was trilingual, but was unlike him in not being 'three gentlemen at once'. He is just the same whether he writes in French, Latin, or English; he can be tedious in all three languages. There is on the face of it no reason why a poem written on the scheme adopted in *Confessio Amantis* should ever stop. It is 33,000 lines long. To bracket Gower and Chaucer together, as was done by many early and some later critics, is even more absurd than to couple Jonson and Fletcher with Shakespeare. The men have really nothing in common, save that they were friends and contemporaries. Chaucer was a genius; Gower



Porter Governor

A, Lever to steam-valve.  
W, Weight controlling mechanism.

a man of no very great amount of talent. Gower's death did not eclipse the gaiety of nations; but his work helped to establish the standard literary language. For that he must have his meed of praise. Gower's complete works have been edited by G. C. Macaulay in four volumes.

**Goyana**, a town of Brazil, in the state of Pernambuco. It has some trade in cotton, sugar, rum, hides, timber, castor-oil, &c. Pop. 13,000.

**Goya y Lucientes**, Francisco José de (1746-1828), Spanish painter and etcher. His work includes church decorations in Seville, Toledo, and Valencia; genre pictures of contemporary Spanish life; many portraits, notable among which are *The Duchess of Alba* and *Charles IV and his Family*; and a fine series of etchings. It is marked by great technical skill, a powerful and fantastic imagination, and a bitterly satirical outlook. Goya has exercised great influence on modern European art, especially in France.

**Goyaz**, an inland state of Brazil; area, 288,462 sq. miles. The chief occupation of the inhabitants is cattle-rearing and agriculture. Gold and diamonds have been found. Pop. 511,919. The chief town, also called Goyaz, has a cathedral and Government palace. Pop. about 25,000.

**Gozo**, an island of the Mediterranean, belonging to Britain, about 4 miles north-west of Malta; area, 26 sq. miles. A good deal of corn and fruit is raised; but the most important crop is cotton. The chief town, Rabato, contains about 3000, and the whole island about 20,000 inhabitants.

**Gozzi**, Carlo, (1722-1806), Italian dramatist. His principal work consists of a series of dramas based on fairy tales, which obtained much popularity.

**Gozzoli**, Benozzo (1420-1498), Italian painter. His name is specially identified with the great series of mural paintings in the Campo Santo, at Pisa, consisting of 24 subjects from the Old Testament, from *The Invention of Wine by Noah* to *The Visit of the Queen of Sheba to Solomon*.

**Graaff Reinet**, a town, Cape Province, capital of a division of the same name, the oldest and largest town in the midland district of the province. Owing to irrigation the district is extremely fertile. It has good schools. Pop. (1921), 9222 (4498 white); white pop. 1926, 4576.

**Gracchus**, Tiberius Sempronius (163-133 B.C.) and Gaius Sempronius (153-

121 B.C.), Roman reformers. The brothers, having lost their father early, received from their mother Cornelia a careful education. Tiberius early made himself conspicuous by his military service at the siege of Carthage and in the Numantian War. In 133 B.C. he offered himself as a candidate for the tribuneship. His first efforts were directed to a reform of the Roman land system, by the restoration or enforcement of the old Licinian law, which enacted that no one should possess more than 500 acres of the public domains, and that the overplus should be equally divided among the plebeians. This law, which was now called, after Gracchus, the *Sempronian*, or the *Agrarian law*, he revived, but with the introduction of several softening clauses. But fortune turned against him; he was accused of having violated his office, and of aspiring to be king; and at the next election for the tribuneship he was slain, with 300 of his followers, at the entrance to the Temple of Fides. Ten years after the death of his brother, Tiberius, the younger Gracchus obtained the tribuneship. In the discharge of his office he first of all renewed his brother's law, and avenged his memory by expelling many of his most violent enemies from the city. Several popular measures gained him great favour with the people, but the intrigues of the nobles ultimately caused his fall. Opimius, one of his bitterest enemies, was chosen to the consulate. A tumult, in which a licitor of Opimius was killed, gave the Senate a pretence for empowering the consuls to take strong measures. Opimius made an attack upon the supporters of Gracchus with a band of disciplined soldiers. Nearly 3000 were slain, and Gracchus escaped to the grove of the Furies, where he was slain at his own request by a slave, who then killed himself.

**Grace**, William Gilbert (1848-1915), English cricketer. In 1864 he made his first appearance in a leading cricket match at the Kennington Oval, Surrey's famous ground, and from 1870 to 1900 he played in the Gloucestershire county eleven. From 1899 he was secretary and general manager of the London County Cricket Club. His greatest achievements were accomplished with the bat, but he was a master of all departments of the game. His publications comprise: *Cricket* (1891), *Cricketing Reminiscences and Personal*

*Recollections* (1899), and *W. G.'s Little Book* (1909).

**Grace, Days of**, in commerce, a certain number of days immediately following the day, specified on the face of a bill or note, on which it becomes due. Till the expiry of these days payment is not necessary. In Britain and America the days of grace are three. The number of days of grace depends on the law of the place where the bill is payable, not of that where it is drawn or endorsed.

**Graces** (Gr. *Charites*, translated by the Romans *Gratiæ*), the goddesses of grace, from whom comes everything beautiful and agreeable. According to most poets and mythologists they were three in number, the daughters of Zeus and Eury-nôme, and Hesiod gives them the names of *Aglaiä* (brilliancy), *Thalia* (the blooming), and *Euphrosynê* (mirth).

**Graciosa**, one of the Azores. The chief town is Santa Cruz. Pop. 8000.

**Gradisca**, a town and district of Italy, formerly belonging to Austria-Hungary. The town of Gradisca is situated on the right bank of the Isonzo, about 30 miles north-west of Trieste. Pop. of district, 34,155.

**Graffiti**, the rude designs and inscriptions of popular origin drawn or engraved with a style upon the walls of ancient towns and buildings, particularly of Rome and Pompeii. Those in Pompeii are in Latin, Greek, and Oscan, showing that the ancient language of Campania was still extant among a portion of the populace. The inscriptions are mostly amatory or humorous, sometimes malicious or obscene. In Rome graffiti occur frequently in the catacombs.

**Grafting**, in horticulture, a method of artificial vegetative propagation, in which a twig bearing one or more buds, the scion, is inserted into a stem (or root) of a rooted plant, the stock. A common method, termed cleft-grafting, is illustrated in the figure. Budding and inarching are special forms of grafting.

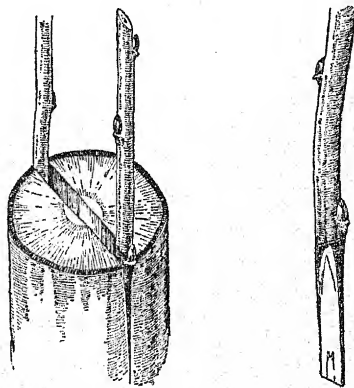
**Grafton**, a town in New South Wales, on both sides of the River Clarence, here navigable, about 45 miles from the sea. It is in a rich agricultural district, has sugar-mills, and carries on a good trade. Pop. 4670.

**Gragnano**, a town, Italy, province of Naples, with macaroni factories and exports of red wine. Pop. 15,000.

**Graham, John**. See *Dundee, Viscount*.  
**Graham, Stephen** (1884— ), British author and traveller. He has written a considerable amount about Russia, has wandered in the Caucasus and in Central Asia, and has been with Russian pilgrims to Jerusalem and with emigrants to America. His books include: *A Vagabond in the Caucasus*, *Undiscovered Russia*, *With Russian Pilgrims to Jerusalem*, and *In Search of El Dorado*.

**Graham, Thomas** (1805–1869), British chemist. He investigated the laws of diffusion of gases, and established the distinction between crystalloids and colloids.

**Grahame-White, Claude** (1879— ), British aviator and builder of aeroplanes. He won the International Gordon-Bennet aeroplane race in America with a Gnome-Bleriot in 1910. The Grahame-White Aviation Company, which he formed, acquired the aerodrome at Hendon, where he started an aviation school. His works include: *The Aeroplane, Past, Present, and Future* (1911); and *Flying, an Epitome and a Forecast* (1931).



Cleft-grafting

**Graham Land**, a tract of land in the Antarctic Ocean; discovered in 1832 by Biscoe, who took possession of it for Great Britain. It stretches between lat. 63° and 68° s., and long. 61° and 68° w. There is a meteorological station on the west coast.

**Grahamstown**, a town of Cape Province, S. Africa, the metropolis of the Eastern Provinces, on the Zuurberg slopes. It has the Rhodes University College



(founded in 1904) and other educational institutions. Pop. (1921), 14,819 (7180 white); white pop. 1926, 7652.

**Grail**, the legendary vessel from which Christ dispensed the wine at the Last Supper. It was said to have been brought to England by Joseph of Arimathea, but to have been taken back to heaven until the appearance of heroes worthy to be its guardians. It was visible only to the baptized and pure of heart. With this legend that of King Arthur became connected. Three of his knights, Galahad, Percival, and Bors, had sight of it, and on the death of Percival, its last guardian, it was again taken to heaven.

**Graining** (*Leuciscus lancastris*), a fish of the dace kind, found chiefly in the Mersey and its tributaries, and in some of the Swiss lakes.

**Grains of Paradise**, Guinea grains or Meleguetta pepper, the aromatic seeds of *Amomum Meleguetta*, a plant of tropical Western Africa.

**Grakle**, or **Grackle**, a name applied to the Indian hill-starlings. One of these is the myna bird (*Eulabes religiosa*), which can imitate the human voice.

**Gramme**. See *Weights and Measures*.

**Grammichele**, a town of Sicily, 33 miles south-west of Catania. There are marble-quarries in the vicinity, and there is a trade in grain, cotton, and wine. Pop. 17,000.

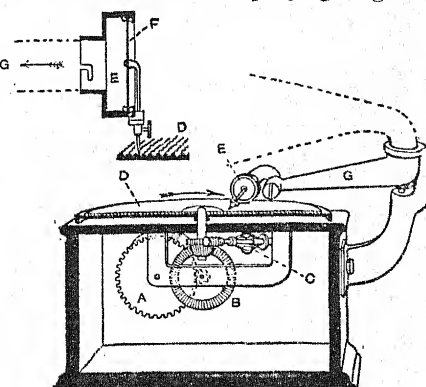
**Grammont**, a town of Belgium, East Flanders, on both sides of the Dender. The chief manufactures are linen, lace, thread, paper, and tobacco-pipes. Pop. 12,619.

**Gramont**, Philibert, Comte de (1621-1707), French courtier. He went to England two years after the Restoration, and was on familiar terms with Charles II. His *Mémoires du Comte de Gramont* were dictated to his brother-in-law, Anthony, Count Hamilton, who died in 1720.

**Gramophone**, an instrument for recording and reproducing speech and music by purely mechanical means. Thomas A. Edison invented his first talking-machine in 1877, and called it a *phonograph*; and a later inventor introduced the word *gramophone*. Edison's phonograph may be considered as a direct descendant of the *phonautograph*, which had been invented in 1856 by Leon Scott. Between this date (1856) and Edison's phonograph (1877) the electric telephone had been

invented by Graham Bell. Edison's phonograph combined the ideas of the recording diaphragm of the phonautograph and the reproducing diaphragm of the telephone.

The principle of the modern gramophone is shown in the accompanying diagram.



Section of a Gramophone

The driving energy is got from a large mainspring contained in the cylinder A, and the power is transmitted to the large bevel wheel B by means of a ratchet wheel and pinion. A bevel pinion fits into B, the pinion being carried on the lower end of a short upright shaft, to the top of which is fastened the turn-table on which the record D is placed. The rate of revolution is kept constant by means of the governor C. The sound-box E contains the diaphragm, which may be a disc of mica, and to this is attached the stylus, which moves with the vibrations of the diaphragm and cuts the record on the disc of wax. A large horn, acting as a megaphone, is attached to the tone-arm G, which is a metal tube connecting the sound-box to the horn. The smaller illustration is an enlargement of the sound-box E, showing the position of the mica diaphragm F, with its stylus, on the lower end of which is a socket and thumb-screw for holding the needle point in place. The grooves of the record D have been enlarged to show how the needle moves in the groove.

**Grampians**, The, a mountain range, or rather series of ranges, stretching across Scotland south-west to north-east for about 150 miles. It commences in Argyll-

shire, and at the boundaries of Perthshire and Aberdeenshire may be said to separate into two distinct branches—one on the north side of the Dee, terminating near Huntly; the other running on the south side of that river, and terminating near Stonehaven. With the exception of Ben Nevis, the Grampians comprise all the highest mountains in Scotland, Ben Cruachan, Ben Lomond, Ben Lawers, Schiehallion, Ben Macdhui (4296 feet), Cairngorm, and Cairntoul. The more remarkable passes are those of Leny, Aberfoyle, Glenshee, and Killiecrankie.

**Grampus**, a popular name for several marine cetaceous mammals allied to the dolphins, especially *Orca gladiator* of the Atlantic and North Sea, which grows to the length of 30 feet.

**Gran.** See *Esztergom*.

**Granada**, a city in the south of Spain, capital of the province of Granada. The special features of the town are the Alhambra (q.v.) or palace of the Moorish kings, and another Moorish palace called the *Generalife*. Granada has no manufactures of importance. Its university was founded about 1530, and is attended by some 1000 students. The city was founded by the Moors before 800, and in 1235 became the capital of the Moorish kingdom of Granada, and attained almost matchless splendour. In 1491 it remained the last stronghold of the Moors in Spain, but was taken by the Spaniards under Ferdinand and Isabella in 1492. Its prosperity continued till 1610, when the Moors were expelled from Spain. Pop. 104,079.—The province, which is partly bounded by the Mediterranean, has an area of 4928 sq. miles. Pop. 583,445.

**Granada**, formerly a Moorish kingdom in Spain, bordering on the Mediterranean, now represented by the three provinces Granada, Almeria, and Malaga; area, 11,128 sq. miles. After long forming part of the Kingdom of Cordova, Granada became a separate kingdom in 1235. In 1492 it passed into the possession of the Spaniards.

**Granada**, a city of Nicaragua, with a trade in dyewoods, indigo, cocoa, and wool. It manufactures gold-wire chains. Pop. 16,773.

**Granadilla**, the West Indian name for the fruits of various species of *Passiflora*, a genus of the passion-flower family.

**Granby**, John Manners, Marquess of

(1721–1770), British soldier. He became lieutenant-general in 1759, commanded the British troops in the Seven Years' War (1760–1763), and was Commander-in-Chief of the British army from 1766 to 1770. He was elected to Parliament in 1754, 1761, and 1768.

**Granby**, a town of Quebec, Canada, on the C.N.R., 56 miles from Montreal. It has sawmills, machine-shops, and manufactures of furniture, rattan goods, tobacco, &c. Pop. 6785.

**Gran Chaco**, El, a territory of the Argentine Republic; area, 52,740 sq. miles. In the west it is intersected by offsets of the Andes, and in the east forms extensive plains and marshes. A large area is covered with primeval forest. It is inhabited by Indian tribes, the Indian population being estimated at from 20,000 to 40,000. Many parts seem well adapted for growing sugarcane, tobacco, maize, rice, &c., if not for cereals generally. The name also embraces a region extending into Bolivia.

**Grand Bahama Island**, one of the Bahama Islands (q.v.).

**Grand Banks**, a submarine elevation 200 miles long, lying south by east of Cape Race, in Newfoundland. The area is 500,000 sq. miles, and the waters teem with fish, especially cod. The fishing season is from June to mid-November.

**Grand Bassam**, a port on the French Ivory Coast, Gulf of Guinea, with excellent anchorage. It exports rubber, ivory, wax, gold, &c. Pop. 3000.

**Grand Canal**, a great waterway of China, connecting Hangchow and Tientsin, and cut in two at Chinkiang by the Yangtze Kiang. It is 850 miles long, and part of it was in use in 480 B.C.

**Grand Canyon**, a gorge in Arizona, U.S.A., through which runs the Colorado River. It is over 200 miles long, and varies in width from 3000 to 6000 feet.

**Grand Falls**, a town of Newfoundland, on the Exploits River, 22 miles from Botwood, its port. The river falls supply power for the operation of the enormous paper-mills of the Anglo-Newfoundland Development Company. Pop. 4000.

**Grand Falls**, a town of New Brunswick, Canada, at the head of navigation on St. John River. It is an important lumber centre, and has a great water-power reserve. Pop. 1327.

**Grand Forks**, a city of North Dakota, U.S.A., the centre of an agricultural

district. There is a trade in lumber, wheat, and flour, and there are various manufactures. Pop. 14,010.

**Grand Jury.** See *Jury and Jury Trials*.

**Grand' Mère**, a town of Quebec, Canada, on the C.N.R. and the C.P.R. It has great pulp- and paper-mills. Pop. 7631.

**Grand Rapids**, a city, U.S.A., Michigan, situated on the rapids of the Grand River, 40 miles from its mouth. It is connected with the railway systems of the United States and Canada, and is an important centre for the distribution of pine and hardwood lumber. It has large manufactures of furniture, wooden ware, agricultural implements, brushes, and machinery. Pop. 137,634.

**Grangemouth**, a burgh and seaport, Stirlingshire, Scotland, at the entrance to the Forth and Clyde Canal. There is a dock area of 60 acres, a quay length of 4925 yards, and accommodation for vessels of 6000 tons drawing 26 feet. There are graving-docks and all cargo facilities. It has shipbuilding yards, sawmills, a rope and sail factory, and brickworks. Coal and oil are chief exports. Pop. (1931), 11,798.

**Granite**, a coarsely crystalline unstratified rock, composed generally of the minerals quartz, potassium-felspar, and mica, mingled without regular arrangement of the crystals. It is one of the most abundant of the igneous rocks, and has consolidated under pressure deep down in the earth. It belongs to various ages from the Pre-Cambrian to the Cainozoic, the Alps of Europe and the hills of Skye containing granite of the latter age. It forms some of the most lofty mountain chains. In some granites, mica is replaced by hornblende; when both mica and hornblende are present, it is called *syenitic granite*. The term *pegmatite* is used for any coarse granite found in veins. Granite contains many accessory minerals, such as beryl, garnet, and tourmaline. It is not rich in metallic ores.

**Gran Sasso D'Italia**, or **Monte Corno**, a mountain of Naples, the culminating peak of the Apennines; height, 9585 feet.

**Grant, Sir Alexander** (1826–1884), British scholar and educationalist. He became vice-chancellor of Bombay University in 1863, director of public instruction in Bombay Presidency in 1865, and vice-chancellor and principal of Edinburgh University in 1868. He is best known by his annotated edition of Aristotle's

*Ethics* (first published 1857), and his *Story of the University of Edinburgh during its First Three Hundred Years* (1884).

**Grant, Sir Francis** (1803–1878), Scottish painter. He became noted for sporting scenes and portraits, afterwards painting many persons of note, including Queen Victoria, the Prince Consort, Lord John Russell, and Beaconsfield. He became P.R.A. in 1866.

**Grant, James** (1822–1887), British novelist. His works include: *Adventures of an Aide-de-Camp*, *Bothwell*, *Frank Hilton*, *Harry Ogilvie*, *Lucy Arden*, *Mary of Lorraine*, *King's Own Borderers*, and *White Cockade*.

**Grant, James Augustus** (1827–1892), Scottish soldier and traveller. He is chiefly noted as having accompanied Captain Speke in his search for the sources of the Nile (1860–1863), an expedition described in his work *A Walk Across Africa*.

**Grant, Ulysses Simpson** (1822–1885), American general and eighteenth President of the United States. On the outbreak of civil war in 1861 he was chosen captain of a company of volunteers, and was rapidly promoted to a brigadier-generalship of volunteers. He seized Paducah, commanding the Tennessee and Ohio navigation; checked the departure of reinforcements from Belmont, captured Fort Henry and Fort Donelson, and won the two days' battle of Shiloh. He then gained a new victory at Vicksburg, and after repulsing the Confederates before Corinth commenced operations against Vicksburg. After a siege of some months the town surrendered. For this Grant was made major-general in the regular army, and placed in command of the Mississippi division. The battles of Chickamauga and Chattanooga, which followed, opened the way into Georgia for the Federal troops. In Feb., 1864, he was appointed lieutenant-general, and assumed command of the armies of the United States. In a succession of hotly-contested battles at the Wilderness, Spottsylvania, North Anna, and Cold Harbour, he steadily advanced on Petersburg and Richmond. These speedily fell, and Lee, defeated at Five Forks and completely surrounded, surrendered to Grant on 9th of April, 1865. Grant returned to Washington, and in 1866 was made general of the armies of the United States. He was elected President in 1868, and re-elected in 1872.

**Grant**, in law, a gift in writing of such a thing as cannot be passed or conveyed by word only; thus, a grant is the regular method by the common law of transferring the property of incorporeal hereditaments, or such things whereof no actual delivery of possession can be had.

**Grantham**, a borough of England, in Lincolnshire. Among the notable buildings are the thirteenth-century church, the thirteenth-century Angel Inn, and the grammar school (founded in 1528). The industries are mostly connected with agriculture. Pop. (1931), 19,709.

**Grant Land**, a tract of land within the Arctic Circle, belonging to British North America. It forms the northern portion of Ellesmere Land.

**Granton**, a seaport, Midlothian, Scotland, with accommodation for vessels of 3000 tons. Coal is largely exported, and the port is a landing-place for North Sea trawlers. Granton is part of the City of Edinburgh.

**Grantown-on-Spey**, a burgh of Scotland, Morayshire, a favourite summer-resort. Pop. (1931), 1577.

**Granvella**, or **Granvelle**, Antoine Perrenot, Cardinal de (1517–1586), Spanish statesman. On the death of his father in 1550 he was appointed by Charles V to succeed him in the office of Chancellor. Under Philip II he remained chief minister, and in 1559 negotiated the Peace of Câteau-Cambrésis. In 1560 he became Archbishop of Mechlin, and in 1561 was made a cardinal. In 1570 Philip sent him to Rome and afterwards to Naples as Viceroy. In 1575 he was recalled to Spain, and placed at the head of the Government with the title of President of the Supreme Council of Italy and Castile. He preserved all letters and dispatches addressed to him, nine volumes of which, published 1851–1862, are of value in illustrating the history of the sixteenth century.

**Granville**, Granville George Leveson-Gower, second Earl (1815–1891), English statesman. In 1840 he became Under-Secretary for Foreign Affairs, in 1846 succeeded to the peerage, in 1848 was appointed Vice-President of the Board of Trade, and in 1851 succeeded Palmerston as Foreign Secretary. In 1855 he became Chancellor of the Duchy of Lancaster, President of the Council, and ministerial leader of the House of Lords. From 1859 to 1866 he was again President of the

Council. In 1868 he was Colonial Secretary under Gladstone, and on the death of Clarendon in 1870 succeeded to the Secretaryship for Foreign Affairs, which he held until 1874. On the return of Gladstone to office in 1880 Lord Granville again became Foreign Secretary, until Lord Salisbury came into power in 1885. In the short Gladstone ministry of 1886 he was Colonial Secretary.

**Granville**, a fortified seaport, France, department of Manche, at the mouth of the Boscq, in the English Channel. Pop. 11,347.

**Granville**, a town of New South Wales, Australia, situated within the boundaries of Greater Sydney. It is a manufacturing centre, and has a population of 14,370.

**Grape-fruit**, a fruit akin to the orange, but somewhat larger, grown in Jamaica and other West Indian islands, in Florida, and elsewhere, having a bitter-sweet flavour, and a juice considered wholesome and refreshing.

**Grape-hyacinth**, the common name of plants of the lily family and genus *Muscari*, charming early spring-flowering bulbs, with flowers mostly of different shades of blue, on scapes 4 to 8 inches high; easily grown in borders and pots.

**Graphite**, also known under the names of *Plumbago*, *Black-lead*, and *Wad*. It is found at Borrowdale, in Cumberland, and in large quantities in Canada, Ceylon, and Bohemia. Graphite is used chiefly in the manufacture of pencils, crucibles, and portable furnaces, in burnishing iron to protect it from rust, for giving a smooth surface to casting moulds, for coating wax or other impressions of objects designed to be electrotyped, and for counteracting friction between the rubbing surfaces of wood or metal in machinery. Artificial graphite is produced by the treatment of anthracite in the electric furnace. One of its principal uses is to form the electrodes of this kind of furnace.

**Graptolite**, a member of a group of fossil hydrozoa having many characteristics in common with the living scyphozoans. The genera and species of graptolites have proved very useful as indicating successive zones in the early Palaeozoic systems.

**Graslitz**, German name of *Kraslice* (q.v.).

**Grasmere**, a beautiful lake, England, county of Westmorland, of oval form, about 1 mile long by  $\frac{1}{2}$  mile broad. The



village of Grasmere is at the head of the lake.

Grasse, a town, France, department of Alpes Maritimes. It has extensive manufactures of perfumery, and is a favourable winter-resort for invalids. Pop. 19,700.

Grasses, a name equivalent to the botanical order Gramineæ, a very extensive and important order of monocotyledons, comprising about 250 genera and 4500 species, including many of the most valuable pasture plants, all those which yield corn, the sugar-cane, the tall and graceful bamboo, &c. The more important divisions of the natural order of grasses are: the Panicæ (millet, fundi, Guinea grass); the Andropogoneæ (sugar-cane, dhurra, lemon-grass); the Maydeæ (maize, Job's tears); the Phalarideæ (canary-grass, vernal grass); the Oryzæ (rice); the Stipeæ (feather-grass, esparto); the Agrostidæ (bent-grass, foxtail grass, Timothy grass); the Aveneæ (oats, soft grass); the Festuceæ (fescue, meadow-grass, manna-grass, teff, cock's-foot grass, tussac grass, dog's-tail grass); the Bambuseæ (bamboo); the Hordeæ (wheat, barley, rye, spelt, rye-grass, lyme-grass). In its popular use the term grasses is chiefly applied to the pasture grasses as distinct from the cereals, &c.; but it is also applied to some herbs, which are not in any strict sense grasses at all, e.g. rib-grass, scurvy and whitlow grass. It is customary to call the clovers, trefoils, sainfoin, and other flowering plants grown as fodder, *artificial grasses*, by way of distinction from the grasses proper, which were termed *natural grasses*. The species of grass often indicates the quality of the soil; thus, *Holcus*, *Dactylis*, and *Bromus* are found on sterile land, *Festuca* and *Alopecurus* on a better soil; *Poa* and *Cynosurus* are only found in the best pasture land. See *Dog's-tail Grass*; *Fescue*; *Foxtail*; *Tussac*; &c.; and Plate.

Grasshopper, the name of various leaping insects of the order Orthoptera, included with locusts in the family Acridiidae. They are characterized by short antennæ, long, slender legs, and large, delicate wings. Grasshoppers are easily recognizable by their powers of leaping and the chirping noise made by the males. There is an organ of hearing in the basal segment of the abdomen. Green grasshoppers, *par excellence*, belong to a different family (Locustidæ), and are more delicate in structure.

Grass of Parnassus, a genus of plants, order Saxifragaceæ, and found for the most part in boggy situations in the colder northern countries. The common Grass of Parnassus (*Parnassia palustris*) is a beautiful autumnal plant with heart-shaped leaves and a single white flower.

Grass-tree, the popular name of a genus of Australian plants (*Xanthorrhoea*) of the nat. ord. Liliaceæ. The base of the leaves is used for food and the leaves themselves for fodder. All the species are popularly called black-boys. *Akaroid resin* is obtained from them.

Grass-wrack, or Sea-grass (*Zostera marina*), a plant belonging to the Naiadaceæ, common on European coasts. It forms green beds at the bottom of shallow seas, and when dried is used for packing. The ash contains soda.

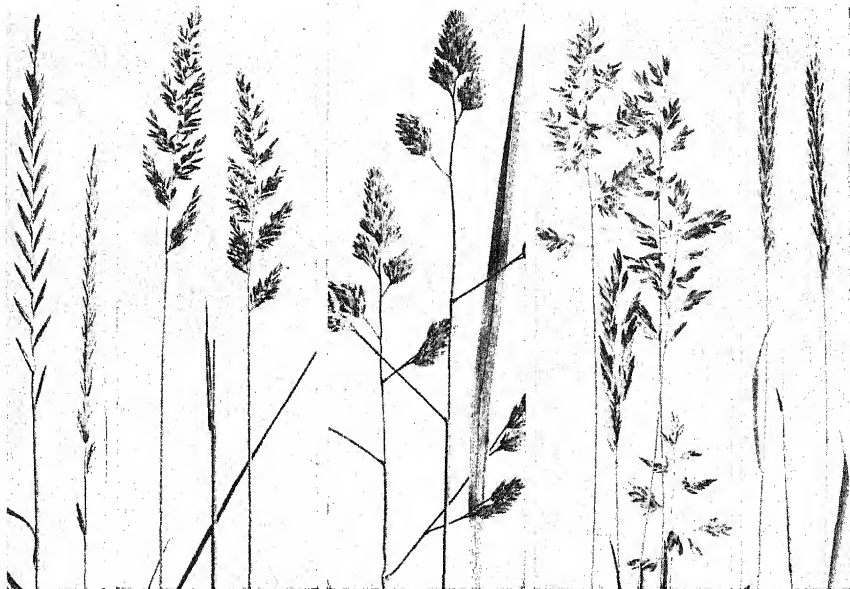
Gratian, otherwise Gratianus Augustus (359-383), Roman Emperor, eldest son of the Emperor Valentinian I. On the death of Valentinian in 375 the Eastern Empire remained subject to Valens, and Gratian was obliged to share the western part with his half-brother, Valentinian II, then four years old. He was put to death at Lyons in the eighth year of his reign.

Gratiola, a genus of plants, the hedge-hyssop genus, nat. ord. Scrophulariaceæ, containing about twenty species of tropical herbs. *G. officinalis* grows in meadows in Europe.

Grattan, Henry (1746-1820), Irish orator and statesman. In 1780 he moved resolutions asserting the Crown to be the only link between Britain and Ireland, and in 1782 led the volunteer movement, which was instrumental in securing the concession of independence to Ireland. For these services the Irish Parliament voted him £50,000 and a house and lands. The corruption of its members and the uncertain relations with England resulted in the failure of 'Grattan's Parliament'. Grattan himself became opposed to the popular feeling as represented by the United Irishmen, and in 1797 temporarily seceded from Parliament and lived in retirement. In 1800 he came forward as member for Wicklow to oppose the Union.

Graudenz, a town of Poland, formerly in Western Prussia, on the right bank of the Vistula. The manufactures include machinery, castings, cigars, tobacco,

# BRITISH GRASSES



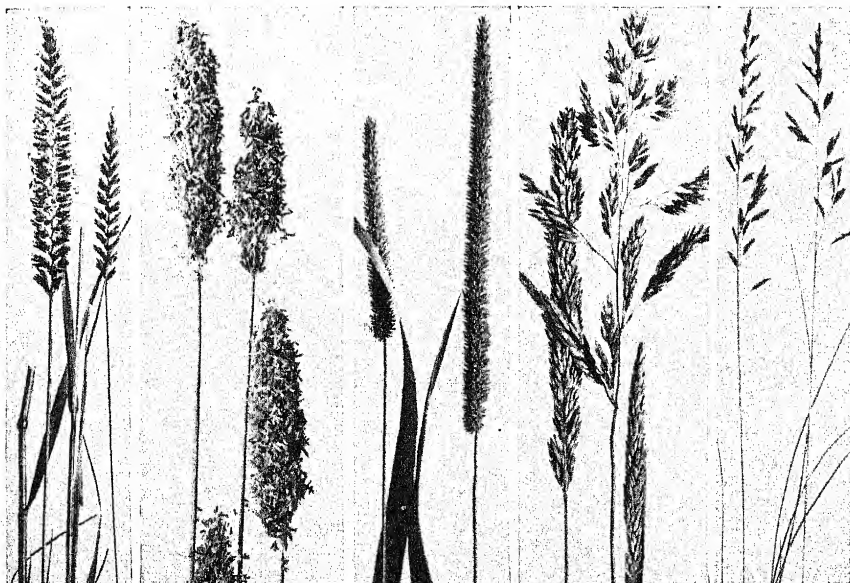
Couch Grass

Crested Hair Grass

Clustered Cock's-foot

Annual Poa

Sweet Anthoxanth



Crested Dog's-tail

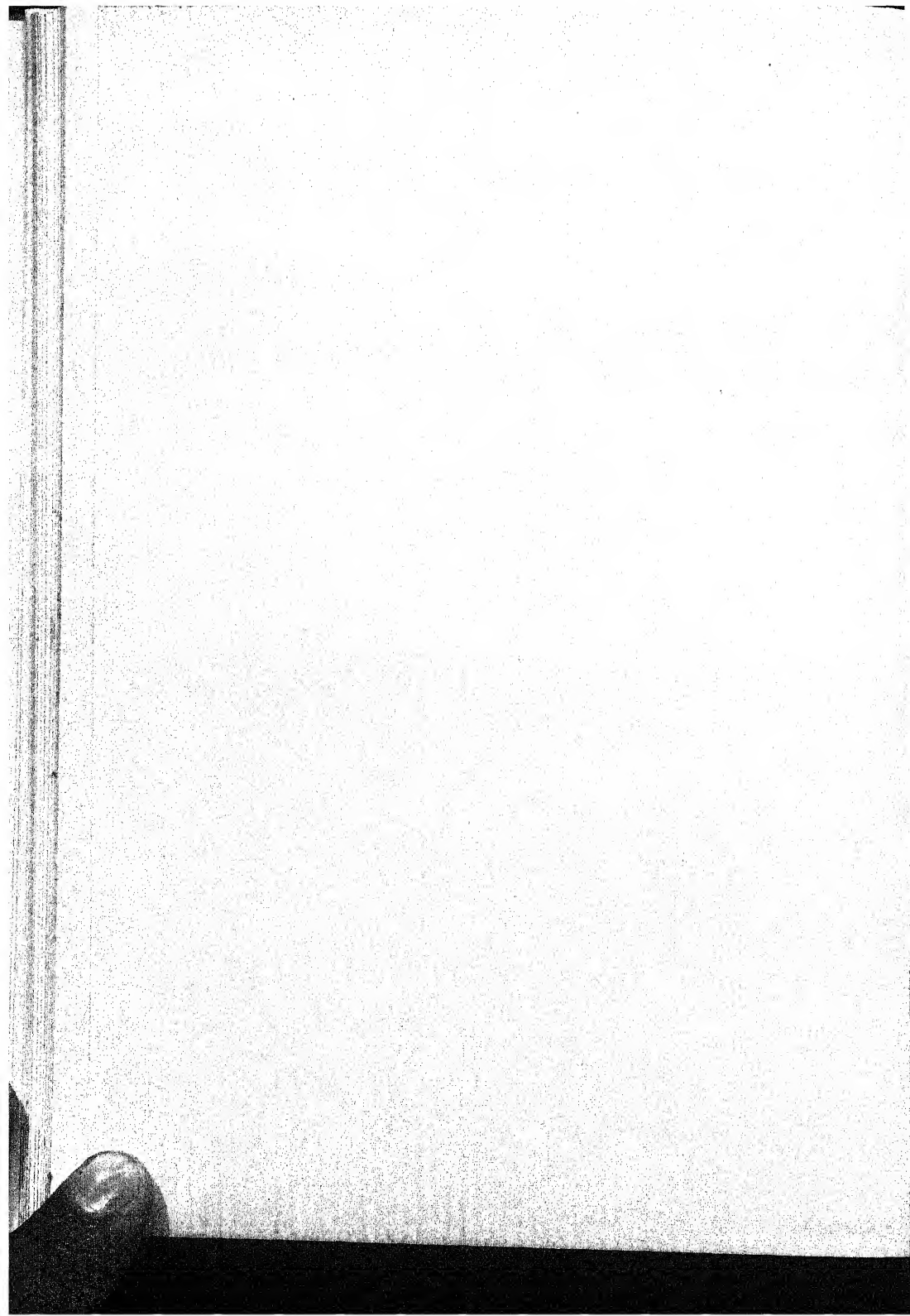
Meadow Fox-tail

Cat's-tail

Meadow Soft Grass

Sheep's Fescue

Photographs by Henry Irving



brushes, &c., and there are several breweries and distilleries. Pop. 40,325.

**Gravelines**, a small seaport and second-class fortress, France, department of Nord. There is accommodation for vessels of 600 tons drawing 18 feet. Pop. 5890.

**Gravesend**, a borough of England, in Kent, on the south bank of the Thames, 21 miles east of London. It is a great rendezvous for shipping, the boundary port of London, and troops and passengers frequently embark there to avoid the passage down the river. There is some trade in supplying ships' stores, and boatbuilding and iron-founding are carried on. Pop. (1931), 35,400.

**Gravina**, a town of South Italy, province of Bari, on the Gravina. It has a cathedral and a college. Pop. 19,900.

**Gravitation**, the force by reason of which all the bodies and particles of matter in the universe tend towards one another. According to the law of gravitation discovered by Newton, every portion of matter attracts every other portion with a force directly proportional to the product of the two masses, and inversely proportional to the square of the distance between them. Kepler had given the laws, deduced from observation, according to which the planets describe their orbits. From these Newton deduced the laws of the force in the case of the planets; and subsequently he generalized the statement of them, by showing the identity of the nature of the force that retains the moon in her orbit with that which attracts matter near to the surface of the earth. See *Relativity*.

**Gray**, Asa (1810-1888), American botanist. His works include: *Elements of Botany* (1836), *A Manual of Botany* (1848), and other botanical textbooks; also portions of works on the flora of North America and the Genera Boreali-Americana.

**Gray**, David (1838-1861), Scottish poet. A small volume containing the poem entitled *The Luggie*, some lyrics, and a few sonnets, with the title *In the Shadows*, represents the whole of his work.

**Gray**, Thomas (1716-1771), English poet. He was educated at Eton, and at Peterhouse, Cambridge. He left Cambridge in 1738, and during the next year went a tour on the Continent with Horace Walpole. He returned to England in 1741, and spent some time in London. In 1742

he produced, for him, a considerable amount of poetry—some of it fragmentary, as the ambitious *De Principiis Cogitandi*, a poem which attempted to render Locke into Lucretian Latin, and *Agripina*, a tragedy; but some of it completed, such as the *Ode on a Distant Prospect of Eton College* and the *Hymn to Adversity*. In 1742, through lack of a more definite occupation, he returned to Peterhouse. He was destined to spend most of the rest of his life at Cambridge, although he never held a fellowship. In 1744 he proceeded to the degree of LL.B. The rest of Gray's life was uneventful. In Feb., 1751, he published the famous *Elegy*; it had probably been begun some seven years previously, but the work of polishing it was very slow. He would not have published it even when he did had it not been impudently pirated. *The Progress of Poesy* and *The Bard* were published in 1757. In 1756 Gray migrated to Pembroke College. During the last years of his life he became rather less sedentary in his habits, and went several long walking tours. He died after a short illness.

Gray is perhaps the least productive of all the greater English poets. No man has won so large a reputation with so small an amount of work. Perhaps the main cause of his sterility was the great load of learning which he bore. He was reputed to be the most learned man in Europe. He was probably the best Greek scholar at Cambridge between Bentley and Porson. He knew the literature and history of England, of France, and of Italy. He was interested in criticism, metaphysics, morals, and politics; he had a fine taste in painting, prints, architecture, and gardening. He excelled in his knowledge of botany, zoology, and entomology. He was also a good musician. All this learning tended to make him over-fastidious in his writings. A brain which is continually receiving cannot create much. So Gray's poems occupy a few pages only in any collection, and yet they are among the best poems of their kind in English. Gray's charming *Letters* are full of scholarship, wisdom, and wit in the best sense of the word.—BIBLIOGRAPHY: Sir E. Gosse, *Gray* (English Men of Letters Series); D. C. Tovey, *Gray and his Friends*; *Gray's Letters*, edited by D. C. Tovey.

**Grayling**, a genus of fishes of the family Salmonidæ. The common grayling (*Thy-*



*mallus vulgaris*) is found in Europe from Lapland to North Italy, and there are allied species in Asia and North America. It smells like thyme, hence the generic name. Its general colour is a yellowish-brown, but it often varies with its surroundings.

**Grays Thurrock**, a town of England, Essex, on the Thames, on the railway to Tilbury and Southend. Pop.(1931),18,172.

**Graz**, a town of Austria, capital of Styria, picturesquely situated on the Mur, 90 miles south-west of Vienna. The chief buildings and institutions are the Schlossberg or citadel; the cathedral, built in 1456; the university, founded in 1573; and the Joanneum, for the promotion of agriculture and science. The manufactures consist of woollen, cotton, and silk tissues, machinery, steel, rails, wagons, soap, leather, and ironware. Pop. 152,713.

**Great Bear Lake**. See *Bear Lake*, *Great*.

**Great Circle Sailing**. See *Navigation*.

**Great Eastern**, an iron steamship, the largest vessel of her time, built (1854-1858) at Millwall, on the Thames, for the Eastern Steam Navigation Company; length, 680 feet; breadth, 82½ feet. She had six masts, could spread 7000 sq. yards of sail, and had eight engines, divided between her screws and paddles. From the first her career was unfortunate, and after several unremunerative trips to New York she was employed first as a troopship, and then as a cable-laying ship. She was broken up in 1888.

**Great Falls**, a city of Montana, U.S.A., on the Missouri. It is in a great mining region (copper, silver, gold, &c.). The city has smelting-works and flour-mills. Pop. 24,121.

**Great Fish or Back River**, a river of Northern Canada, rising in Sussex Lake, and flowing, after a course of about 500 miles, into Cockburn Bay, an inlet of the Arctic Ocean.

**Great Fish River**, a river of South-East Africa, near the eastern frontier of Cape Province. It rises in the Snowy Mountains, and falls into the sea after a course of 230 miles.

**Great Lake**, a lake in the centre of Western Cambodia, French Indo-China, which is fed by the overflow of the Mekong River. In the dry season this lake dries till there are only innumerable shallow pools. These are full of fish, and the main

native industry is the catching, drying, and exporting of these.

**Great Lakes**, The, the chain of great freshwater lakes in North America, comprising Lakes Superior, Michigan, Huron, Erie, and Ontario. They have a water area of 94,100 sq. miles, and are connected with one another and with the St. Lawrence by canals. See *Canada*, and articles on various lakes.

**Great Lebanon**, a state since 1920. It is bounded on the north by the Nahr-el-Chebin, south by Palestine, west by the Mediterranean, and east by the heights of Anti-Lebanon. It is held by France under mandate from the League of Nations, but declared its independence in 1926. See *Syria and Lebanon*.

**Great Salt Lake**, a lake, U.S.A., state of Utah, 4000 feet above sea-level, 70 miles in length north to south and 48 miles east to west.

**Great Slave Lake**, a lake of the North-West Territories, Canada. The area is 10,719 sq. miles. Its waters are carried to the Arctic by the Mackenzie.

**Grebe**, the common name of the birds of the genus *Podiceps* and allied genera,



Great Crested Grebe (*Podiceps cristatus*)

family Podicipidæ, characterized by a straight conical bill, no tail, tarsus short,

toes flattened, and legs set so far back that on land the grebe assumes the upright position of the penguin. It is found almost everywhere. They are excellent swimmers and divers; feed on small fishes, frogs, crustaceans, and insects; and their nests are generally placed among reeds. Five species are British, the great crested grebe (*P. cristatus*), the little grebe or dabchick (*P. fluviatilis*), the Slavonian or horned grebe (*P. auritus*), the red-neck (*P. grisegena*), and the rare eared-grebe (*P. nigricollis*). The last three are winter visitors, but the first two remain all the year. There are several North American species. The great crested grebe is about 21 to 22 inches long, and is of commercial value on account of its silvery breast plumage.

Greco, El, the name usually given to Domenico Theotocopuli (c. 1540–1614), Spanish painter. He settled at Toledo some time before 1577, and shortly afterwards painted the *Disrobing of Christ*, now in the cathedral there. Later appeared one of his masterpieces, *The Burial of the Count of Orgaz*, followed by a series of altar-pieces, single figures of saints (including several versions of St. Francis), portraits, and a few landscapes. He is well represented in the National Gallery by the *Agony in the Garden*.

Greece, a republic of South-Eastern Europe, bounded by Albania, Yugoslavia, Bulgaria, Turkey, the Ægean Sea, and the Ionian Sea. Old Greece (territory acquired before 1912) comprises the southern part of the Balkan Peninsula and about 250 islands, including Eubœa, the Cyclades (Syra, Andros, &c.) and the Northern Sporades in the Ægean, and Corfu, Zante, Cephalonia, &c., in the Ionian Sea. As a result of the war with Turkey in 1912–1913, and of that with Bulgaria in 1913, Greece acquired Macedonia, Western Thrace, Epirus, Crete, and various Ægean islands. By the Treaty of Sèvres after the European War, Greece obtained all the former territory of Turkey in Europe west of the Chatalja lines, Western Thrace (from Bulgaria), and the province of Aidin in Asia Minor. Her defeat in the war with Turkey (1921–1922), however, led to the loss of her Asiatic territory, and the Treaty of Lausanne (1923) declared the River Maritsa to be the Turco-Greek boundary. The frontier with Bulgaria was fixed in 1919 by the Treaty of Neuilly. Crete, Samos, Mytilene, and Chios

are now Greek. The area of the Republic is 49,912 sq. miles (including 23,799 sq. miles acquired since 1912), and the population is (1928) 6,204,684. On Mount Athos are 20 monasteries (17 Greek, 1 Russian, 1 Serbian, 1 Bulgarian). The monks form an autonomous community administered by a Council of 4 and a Representative Assembly of 20 members. Greece is remarkable for the extent of its coast-line, due to the numerous gulfs which penetrate inland. The most important of these are the Gulfs of Patras and of Corinth (Lepanto) on the west, and the Gulf of Ægina on the east, which are united by a canal (3½ miles long) across the Peninsula of Corinth, and which separate Northern Greece from the Morea. Other gulfs are Arta and Arkadia on the west, Kalamata and Laconia on the south (between the peninsulas terminating in Capes Gallo, Matapan, and Malia), and Nauplia, Volos, Salonica, &c., on the east. Three-fourths of the interior of Old Greece are mountainous. A branch of the Dinaric Alps, known as the Pindus Mountains, runs down the centre of the country. Along the eastern coast of Thessaly is the range to which Olympus (9754 feet), Ossa, and Pelion belong. From Mount Velukhi in the Pindus chain two ranges run eastward, the Othrys Mountains to the north and the range terminating at Thermopylæ in Mount Oeta (8440 feet) to the south. Another range runs south-east from Oeta to Parnassus. The fertile plain of Thessaly is entirely surrounded by mountains, while east of Parnassus is Lake Copais, which having been drained is now a plain 53,000 acres in extent. The chief rivers west of the Pindus chain are the Arta and the Aspropotamo, while on the east are the Vistritsa and the Salamuria. In the Morea there is a central series of ranges surrounding the Valley of Arcadia and sending offshoots outwards in all directions. The highest mountain is Taygetus (7904 feet). The principal towns are Athens (the capital), Salonica, Piræus, Patras, Volo, and Corfu.

Although only a fifth of the area is cultivable, Greece is principally an agricultural country. The land is held mainly by peasant proprietors, but farming is in a backward state, though irrigation, drainage, and the making of roads have caused great improvement in recent years. The chief crop is currants (Patras being the centre), the annual yield of which is about

100,000 tons. Wheat, maize, barley, and oats are the cereals, olives abound, and figs are common. Rice is grown in Macedonia, and oranges, mandarins, and lemons flourish all over the country. Cheese is the main dairy product. Greece is rich in minerals, lignite, magnesite, copper, iron, tin, lead, and silver being the principal. The chief mining areas are Laurium (silver), Thessaly, Eubœa, and the Ægean Islands. Manufactures are increasing, and the textile, soap, and leather industries are of considerable importance. A great deal of olive oil (12,000,000 gallons per annum) and of wine is made. Forests cover about 1,000,000 acres. In 1929 the value of Greek exports was £18,627,189, and of imports £35,401,402. The main exports are agricultural produce, oils, and beverages, other items being mineral products, medicines, and forest products. In 1929 Greece exported to and imported from Britain goods valued at £2,537,850 and £4,926,441 respectively. More than three-quarters of the total value of exports to Britain represented currants.

Greece is a member of the Latin Union, and the currency unit is the *drachma* of 100 *lepta* (375 drachmæ at par = £1 sterling). The metric system is compulsory, and the Gregorian Calendar was adopted in 1923. There are 9000 miles of roads and 2000 miles of railway track. The mercantile marine consists of 729 sailing vessels of 58,508 tons, and 1528 steamers of 1,256,965 tons.

By a plebiscite taken in 1924 Greece became a republic. The constitution (approved in 1926) provides for a Senate and a National Assembly. The Greek Orthodox Church is established by law, but all religions are tolerated, and there are a considerable number of Roman Catholics and Mahomedans. Education is free and (nominally) compulsory. There are many secondary, two agricultural, and over twenty commercial schools. In Athens are the National University, the Capodistria University, and the Polytechnic (giving instruction in painting, sculpture, mechanics, &c.). The Ministry of Education is also charged with the Service of Antiquities. There is a British School of Archaeology in Athens. Military service is compulsory and universal, the annual contingent of recruits being 35,000. The navy is a small, more or less obsolete force, useful only for police duties.

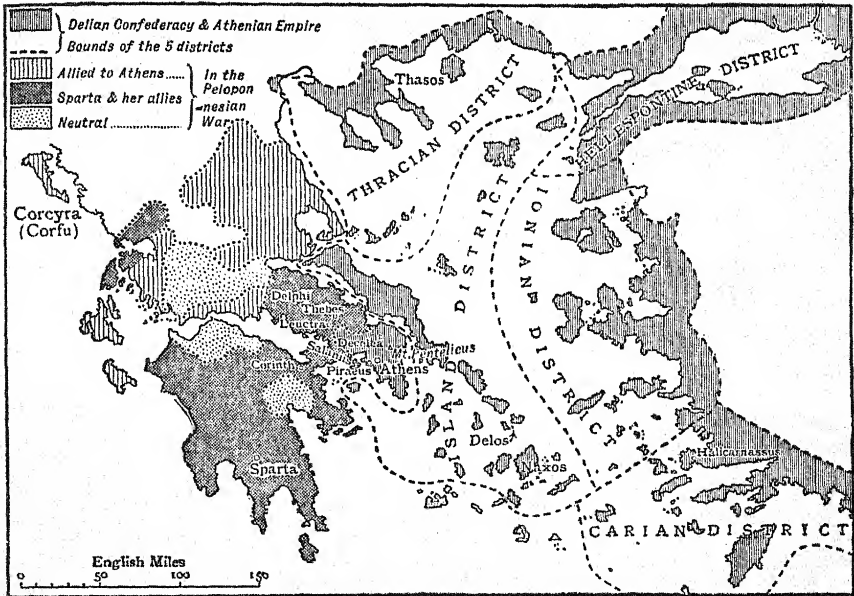
*History.*—The earliest inhabitants of Greece were the Pelasgians, of whom little or nothing is known with certainty. The Pelasgians were succeeded by the Hellènes, or Greeks proper, who may have been simply one of the Pelasgian tribes or races. The Hellènes were divided into four chief tribes—the Æolians, occupying the northern parts of Greece (Thessaly, Boeotia, &c.); the Dorians, occupying originally a small region in the neighbourhood of Mount Oeta; the Achæans, occupying the greater part of the Peloponnesus; and the Ionians, occupying the northern strip of the Peloponnesus and Attica. Of the four principal tribes the Ionians were most influential in the development of Greece. The distribution of the Hellenic tribes was greatly altered by the Dorian migration, sometimes called 'the return of the Heraclids', about 1104 B.C. Of the Achæan inhabitants of the Peloponnesus a large section occupied the territory formerly in possession of the Ionians, henceforward called Achæia. The Ionians driven out of the Peloponnesus found at first a refuge among their kindred in Attica, but owing to its limited territory were soon compelled to leave it and found Ionic colonies on several of the islands of the Ægean Sea and on the middle part of the coast of Asia Minor, where they built twelve cities, afterwards forming an Ionic Confederacy. The principal of these were Ephesus and Miletus. About the same time another body of Greeks, from Thessaly and Boeotia, is said to have founded the Æolian colonies on some of the northern islands of the Ægean, and on the northern part of the western coast of Asia Minor. The southern islands and the southern part of the west coast of Asia Minor were in like manner colonized by Dorian settlers.

In course of time many Greek settlements were made on the coasts of the Hellespont, the Propontis (Sea of Marmora), and the Black Sea, the most important being Byzantium (Constantinople), Sinope, Cerasus, and Trapezus (Trebizonde). There were also flourishing Greek colonies on the coasts of Thrace and Macedonia; for example, Abdera, Amphipolis, Olynthus, Potidea, &c.; and the Greek colonies in Lower Italy were so numerous that the inhabitants of the interior spoke Greek, and the whole region received the name of Greater Greece (Magna Græcia). The most famous of the Greek colonies

in this quarter were Tarentum, Sybaris, Croton, Cumæ, and Neapolis (Naples). Sicily also came to a great extent into the hands of the Greeks, who founded on it or enlarged many towns, the largest, most powerful, and most highly cultured of the Greek colonies here being the Corinthian colony of Syracuse, founded in the eighth century B.C. Other important colonies were Cyrene on the north coast of Africa,

the Greeks, the Amphictyonic League, in which the whole people was represented by tribes (not by states). The fourth bond consisted in the four great national festivals or games, the Olympian, Isthmian, Nemean, and Pythian.

The various separate states of Greece may be divided, according to the form of their constitution, into the two great classes of aristocratic and democratic.



Greece: circa 445 B.C.

and Massilia (Marseille) on the south coast of Gaul.

Although ancient Greece never formed a single state, the various Greek tribes always looked upon themselves as one people, and classed all other nations as *Barbaroi* (foreigners). There were four chief bonds of union between the Greek tribes. First and chiefly, they had a common language, which, despite its dialectic peculiarities, was understood throughout all Hellas or the Greek world. Secondly, they had common religious ideas and institutions, and especially, in the oracle of Delphi, a common religious sanctuary. Thirdly, there was a general assembly of

Sparta or Lacedæmon, the chief town of Laconia and of the Doric tribe, was the leading aristocratic state; and Athens, the capital of Attica and the chief town of the Ionic tribe, was the leading democratic state; and as a rule all the Doric states, and subsequently all those under the influence of Sparta, resembled that city in their constitution; and all the Ionic states, and those under the influence of Athens, resembled it. These two tribes or races are the only ones that come into prominence during the earlier part of Greek history subsequent to the Doric migration. Sparta is said to have derived its form of government, and all its insti-



tutions, in the ninth century B.C., from Lycurgus. The constitution of Athens appears from the legends of Theseus and Codrus to have been at first monarchical, and afterwards aristocratic, and to have first received a more or less democratic character from Solon at the beginning of the sixth century B.C. This was followed about fifty years later by a monarchical usurpation under Pisistratus, and his sons Hippias and Hipparchus, the last survivor of whom, Hippias, reigned in Athens till 510 B.C. After the expulsion of Hippias the Republic was restored, under the leadership of Cleisthenes.

The Greek colonies in Asia Minor and the adjacent islands, after being conquered by Croesus, King of Lydia, fell with the fall of Croesus into the power of Cyrus, King of Persia. In 500 B.C., however, the Ionians revolted with the assistance of the Athenians and Eretrians, and pillaged and burned Sardis. The rebellion was soon crushed by Darius, who destroyed Miletus, and prepared to invade Greece. In 492 he sent an expedition against the Greeks under his son-in-law Mardonius, but the fleet which carried his army was destroyed in a storm off Mount Athos. A second army, under the command of Datis and Artaphernes, landed on Eubœa, and after destroying Eretria, crossed the Euripus into Attica; but it was totally defeated in 490 B.C. on the plain of Marathon by 10,000 Athenians and 1000 Plataeans under Miltiades. In the midst of preparations for a third expedition Darius died, leaving his plans to be carried out by his son Xerxes, who, with an army of 1,700,000 men, crossed the Hellespont in 481 by means of two bridges of boats, and marched through Thrace, Macedonia, and Thessaly, while his fleet followed the line of coast. In the pass of Thermopylæ he was held in check by Leonidas with 300 Spartans and 700 Thespians; but the small band was betrayed and annihilated (480 B.C.); and the way through Phocis and Bœotia being now open he advanced into Attica, and laid Athens in ruins. The deliverance of Greece was chiefly due to the genius and courage of Themistocles, who succeeded in inducing the Persians to attack the united fleet of the Greeks in the narrow strait between Attica and Salamis, and totally defeated them. Next year (479) the Persians were so completely defeated at Plataea by the Greeks under

Pausanias, that only 40,000 reached the Hellespont. The brilliant part taken by the Athenians under Themistocles in repelling this invasion of Athens greatly increased her influence throughout Greece. From this date begins the period of the leadership or *hegemony* of Athens in Greece. In 469 B.C. the series of victories won by the Athenians over the Persians was crowned by the double victory of Cimon over the Persian fleet and army on the Eurymedon, in Asia Minor, followed by the Peace of Cimon, which secured the independence of all Greek towns and islands. Shortly after followed the brilliant administration of Pericles, during which Athens reached the height of her grandeur. The position of Athens, however, and the arrogance and severity with which she treated the states that came under her power made her many enemies. In the course of time two hostile confederacies were formed in Greece, one consisting of Athens and the democratic states of Greece; the other of Sparta and the aristocratic states. At last, in 431, war was declared by Sparta—the Peloponnesian War, which for twenty-seven years devastated Greece. In the first part of the war the Spartans, who invaded Attica in 431 B.C. and three times in the five years following, had considerable successes, which were aided by the pestilence that broke out at Athens and the death of Pericles. In 425, however, Pylos was captured by the Athenian general Demosthenes, and the Spartan garrison on the Island of Sphacteria was compelled to surrender to Cleon. Soon after Cythra fell into the hands of the Athenians, but they were defeated in Bœotia at Delium (424) and at Amphipolis in Thrace by Brasidas in 422, when both Cleon and Brasidas were killed. The Peace of Nicias (421 B.C.), which followed the death of Cleon, brought disaffection into the Spartan Confederacy; but Sparta was victorious at the battle of Mantinea in 418. Soon after this the Athenians resumed hostilities, fitting out in 415 B.C. a magnificent army and fleet, under the command of Alcibiades, Nicias, and Lamachus, for the reduction of Syracuse. The Athenian army and fleet at Syracuse were completely destroyed, and though the war was maintained with spirit the prestige of Athens was seriously diminished. Still she made not unsuccessful efforts to regain her position, conquered the revolted towns

about the Bosphorus, and defeated the Spartan admiral Callicratidas off the islands of Arginusæ in 406. Sparta, however, was now in receipt of Persian aid, and Lysander, having captured nearly the whole Athenian fleet at Ægospotami (405), retook the towns of Asia Minor, surrounded Athens, and blocked the Piræus. In 404 B.C. the Athenians were starved into surrender, the fortifications were destroyed, and an aristocratic form of government established by Sparta. Only a year later (403), however, Thrasybulus was able to re-establish the democracy.

The period which follows the fall of Athens is that of Sparta's leadership or hegemony in Greece. The Spartan rule was not more liked than that of Athens. In 387 the states of Greece, including Sparta, agreed to the disgraceful Peace of Antalcidas, by which the whole west coast of Asia Minor was ceded to the Persians. An act of violence committed by a Spartan general in garrisoning Thebes in 380 was the commencement of the downfall of Sparta. The Thebans revolted under Pelopidas and Epaminondas, and the Spartans on invading Boeotia were so completely defeated at Leuctra in 371 B.C. that they never fully recovered from the blow. With this victory Thebes won the leading place in Greece, which she maintained during the lifetime of Epaminondas, who fell in defeating the Spartans and Arcadians near Mantinea in 362.

Two years after the death of Epaminondas, Philip, the father of Alexander the Great, became King of Macedonia. An occasion for interference in the affairs of Greece was furnished him by the war known as the Sacred War (355-346). It was not, however, till the Locrian War (339-338) that Philip acquired a firm hold in Greece. The battle of Cheronea which ensued (338) turned out, however, disastrously for the allies, and Philip became master of Greece. He then collected an army for the invasion and conquest of the empire of Persia, but before he was able to start he was assassinated (336 B.C.). The design of Philip was taken up and carried out by his son Alexander the Great. At the close of the wars which followed the death of Alexander, and which resulted in the division of his empire, Greece remained with Macedonia. In the course of the first half of the third century B.C. several of the Achæan towns expelled the

Macedonians, and revived an ancient confederacy, which was now known as the Achæan League. Aratus of Sicyon became its leading spirit. Aratus died in 213, and his place was taken by Philopemen, 'the last of the Greeks'. About this time the Romans, who had just come out victorious from a second war with Carthage, found occasion to interfere in the affairs of Greece. Philip V of Macedon was defeated at Cynoscephalæ in 197 B.C., and was obliged to recognize the independence of Greece. The Achæan League thus became supreme in Greece, having been joined by all the states of the Peloponnesus. But the League itself was in reality subject to Rome, which found constant ground for interference until 147 B.C., when the League openly resisted the demand of the Senate, that Sparta, Corinth, Argos, and other cities should be separated from it. In the war which ensued, which was concluded in 146 B.C. by the capture of Corinth by the Roman consul Mummius, Greece completely lost its independence, and was subsequently formed into a Roman province.

On the division of the Roman Empire Greece fell of course to the Byzantine half. From 1204 it formed a part of the Latin Empire of the East, but in 1261 it was re-annexed to the Byzantine Empire, with which it remained till it was conquered by the Turks between 1460 and 1473. From 1715 till 1821 the Greeks were without intermission subject to the domination of the Turks. In 1770, and again in 1790, they made vain attempts at insurrection, but in 1821 Ali, the pasha of Janina, revolted against the Sultan Mahmoud II, and secured the aid of the Greeks by promising them their independence. In 1822 Greece declared her independence, but the following years brought a series of misfortunes. At last a treaty was concluded at London (1827) between Britain, France, and Russia for the pacification of Greece, and when the mediation of these three powers was declined by the Sultan, their united fleets, under Admiral Codrington, annihilated the Turkish fleet off Navarino, 20th Oct., 1827. In the beginning of 1830, a protocol of the allied powers declared the independence of Greece, which was recognized by the Porte in the same year. Otto, a young prince of Bavaria, was proclaimed King of the Hellenes at Nauplia in 1832. He was forced to abdicate in 1862. A Provisional Government

was then set up at Athens, and Prince William George of Denmark was proclaimed as King George I in 1863. In 1864 the Ionian Islands, which had hitherto formed an independent republic under the protection of Britain, were annexed to Greece. Thessaly and part of Epirus were ceded to Greece in 1881, and in 1897 an insurrection in Crete led to the interference of the Greeks and to war with Turkey, the result being the speedy defeat of Greece. In 1912 the Balkan War broke out, Greece joining Serbia and Bulgaria against Turkey. The result of this war was an acquisition of new territories by Greece. In March, 1913, King George was assassinated at Salonica, and was succeeded by his son Constantine. During the European War Greece at first tried to remain neutral, but in the end the policy of Venizelos, who urged his country to join the Allies, prevailed. King Constantine abdicated, being succeeded by his son Alexander, who died in 1920. New elections took place, which resulted in the defeat of Venizelos and the recall of King Constantine, who abdicated (1922) in favour of his son Georgios. King Georgios II abdicated in 1924, and Greece was declared to be a republic. In 1925 Pangalos made himself Premier, and in 1926 he became Dictator and then President. He was overthrown later in the year by Admiral Konduriotis.—BIBLIOGRAPHY: G. Grote, *History of Greece*; A. J. Toynbee, *The Balkans*; Greece (Peace Handbooks published by the Foreign Office).

*Religion of Ancient Greece.*—The religion of the ancient Greeks was polytheism. The Romans, when they interested themselves in Greece, liked to identify the Greek gods with those of their own pantheon; and the Roman names for the Greek gods and goddesses have in some cases almost superseded the Greek names, although sometimes identification is uncertain. The supreme ruler among the gods was Zeus (Roman Jupiter or Juppiter), the son of Kronos (Roman Saturn), who after the subjugation of the Titans and Giants ruled in Olympus, while his brother Pluto reigned over the lower world (Hades, Tartarus), and Poseidōn (Neptune) ruled in the sea. Like reverence was paid to Hēra (Juno), the sister and wife of Zeus, and the queen of Heaven; to the virgin Pallas Athēna (Minerva); to the two children of Lētō (Latona), namely, Apollo, the leader of

the Muses, and his sister the huntress Artēmis (Diana), the goddess of the moon; to the beautiful daughter of Zeus, Aphroditē (Venus), the goddess of love; to Arēs (Mars), the god of war, Hermēs (Mercury), the herald of the gods, and others besides. In addition to these there was an innumerable host of inferior deities (Nymphs, Nereids, Tritons, Sirens, Dryads and Hamadryads, &c.) who presided over woods and mountains, fields and meadows, rivers and lakes. There was also a race of heroes or demigods (such as Heracles or Hercules and Perseus) tracing their origin from Zeus. The Greeks believed that the gods communicated their will to men in various ways, but above all by means of oracles, the chief of which were that of Apollo at Delphi, and that of Zeus at Dodona. Dreams ranked next in importance to oracles, and divination by birds, remarkable natural phenomena, &c., was practised.—BIBLIOGRAPHY: L. R. Farnell, *Cults of the Greek States*; J. E. Harrison, *Prolegomena to the Study of Greek Religion*.

*Greek Language.*—The Greek language belongs to the Indo-European group, and is thus a sister of the Sanskrit, Latin, Teutonic, and Celtic tongues. It is customary to distinguish three leading dialects according to the three leading branches of the Greeks, the Æolic, the Doric, and the Ionic, to which was afterwards added the mixed Attic dialect; besides these there are several secondary dialects. Akin to the Ionic is the so-called Epic dialect, that in which the poems of Homer and Hesiod are written, and which was afterwards adopted by other Epic writers. The Doric was hard and harsh; the Ionic was the softest. The Æolic was spoken on the north of the Isthmus of Corinth (except in Megara, Attica, and Doris), in the Æolian colonies of Asia Minor, and on some of the northern islands of the Ægean Sea. The Doric was spoken in the Peloponnesus, in Doris, in the Doric colonies of Asia Minor, of Lower Italy (Tarentum), of Sicily (Syracuse, Agrigentum); the Ionic in the Ionian colonies of Asia Minor, and on the islands of the Archipelago; and the Attic in Attica. In each of these dialects there are celebrated authors. The Ionian dialect is found pure in Herodotus and Hippocrates. The Doric is used in the poems of Pindar, Theocritus, Bion, and Moschus. In Æolic we have fragments of Alcæus and Sappho. After

Athens had obtained the supremacy of Greece, and rendered itself the centre of all culture, the masterpieces of Æschylus, Sophocles, Euripides, Aristophanes, Thucydides, Xenophon, Plato, Aristotle, Isocrates, Demosthenes, &c., made the Attic the common dialect of literature.

At what time this language first began to be expressed in writing has long been a subject of doubt. According to the usual account, Cadmus the Phœnician introduced the alphabet into Greece; and it is an undoubted fact that the most of the Greek letters are derived from the Phœnician ones. The Greek alphabet possesses the following twenty-four letters:—A, α (alpha), a; B, β (beta), b; Γ, γ (gamma), g; Δ, δ (delta), d; Ε, ε (epsilon), e; Ζ, ζ (zeta), z; Η, η (eta), ē; Θ, θ, ϑ (theta), th; Ι, ι (iota), i; Κ, κ (kappa), k; Λ, λ (lambda), l; Μ, μ (mu), m; Ν, ν (nu), n; Ξ, ξ (xi), x; Ο, ο (omicron, i.e. small o), ô; Π, π (pi), p; Ρ, ρ (rho), r; Σ, σ, ς (sigma), s; Τ, τ (tau), t; Υ, υ (upsilon), u, commonly transliterated by y; Φ, φ (phi), ph; Χ, χ (chi), ch guttural (as in Scottish loch); Ψ, ψ (psi), ps; Ω, ω (omega, or great o), ô.

Modern Greek, as spoken by the uneducated classes, is called *Romaic*. The Greek of the educated classes, that used in the newspapers and other literature of the present day, is distinguished from it by a greater resemblance to the Greek of antiquity, which renders it easy for anyone who has a satisfactory acquaintance with ancient Greek to read the modern literary Greek.

*Greek Literature.*—The commencement of extant Greek literature is to be found in the two epic poems attributed to Homer, the *Iliad* and the *Odyssey* (see *Homer*). The former deals directly with the Trojan War; the latter describes the wanderings of Odysseus (Ulysses) in returning from it. The poet Hesiod, of Ascra in Bœotia, stood at the head of another epic school. Of the sixteen works attributed to him there have come down to us the *Theogony* (Origin of the Gods), the *Shield of Hercules* (a fragment of a larger poem of later authorship), and, most important of all, the *Works and Days*, a didactic work on agriculture. The works of Homer and Hesiod were the principal schoolbooks in Greece, Homer in particular taking in Greek education the place once taken in English education by the Bible. The Homeric and Hesiodic schools begin to

meet in the Homeric hymns composed by different hands between 750 and 500 B.C. Next came the period of Elegiac and Iambic poetry (700–480), both Ionian, the chief names being those of Callinus of Ephesus (flourished about 600 B.C.), Tyrteus, originally of Attica (675), Archilochus of Paros (670), Simonides of Amorgos (660), Mimnermus of Smyrna (620), Solon of Athens (594), Theognis of Megara (540), Phocylides of Miletus (540), Xenophanes of Colophon (510), Hipponax of Ephesus (540), and Simonides of Ceos (480). Greek lyric poetry was inseparably linked with music, the lyric period proper lasting from about 670 to 440 B.C. Two principal schools may be distinguished, the Æolian and the Dorian. To the former belong Alceus (fl. 611–580), Sappho (610), and the real Anacreon (530) (the series of erotic poems long attributed to Anacreon is really Alexandrian). To the Dorian school belong Alcman of Sparta (660 B.C.), Stesichorus (Tisias) of Himera (620), Arion (600), who gave shape to the dithyramb, and Ibycus of Rhegium (540). Simonides of Ceos (480) was even more famous as lyric poet than as elegist, his lyrics marking the commencement of a school of national lyric poetry. His nephew, Bacchylides, was also famous, but the chief was undoubtedly Pindar (522–443). About this time began a new literary development, that of the drama, the earliest names in which are Thespis (536) and Phrynichus (fl. 512–476). The performance at first, however, was merely a sort of oratorio or choral entertainment, until Æschylus (525–456) introduced a second actor, and interspersed choral song with dialogue. The tragedies of Æschylus are unsurpassed, and if equalled are equalled by Shakespeare alone. A third and (according to some authorities) even a fourth actor was added by Sophocles (495–405 B.C.), who supplemented the heroic tragedy of Æschylus with the tragedy of human character and the fundamental passions. Euripides (480–406) brought to the drama new qualities of picturesqueness, homeliness, realism, and pathos. With this rapid growth of tragedy there was a corresponding development of comedy, which assumed an artistic form about 470 B.C. The names of Cratinus (448) and Eupolis (430) are overshadowed by that of Aristophanes (448–385). His work, which alone has survived, but which probably follows the law



of the survival of the fittest, may be regarded as closing the period of the old comedy; the middle comedy of from 390 to 320 (Antiphanes, Alexis, and others) was transitional from the great political comedy to the new comedy of manners, which was vigorous from 320 to 250 in the hands of Menander, Philemon, and Diphilus.

In the meantime a prose literature had arisen, commencing with the group of early Ionian writers (550-450), of which Pherecydes of Syros, Anaximenes, and Anaximander, philosophers, and the logographer or compiler Hecateus of Miletus were chief. Hellanicus of Mitylene (450) was one of the earliest critical historians, but Herodotus (484-428) was the first writer of great historic rank, as he was also the first great prose stylist. Thucydides (471-400?) was the founder of philosophic history, and Xenophon (431-354), who has left excellent historic narratives, was also the earliest Greek essayist. The oldest piece of Attic prose is the essay on Athenian polity wrongly assigned to Xenophon. Other writers in history were Ctesias (*fl.* 415-398), Philistus (363), Theopompus (352), and Ephorus (340). The study which oratory and rhetoric received in Athens was an important factor in shaping Attic prose, the chief orators being Antiphon (480-411), Andocides (*fl.* 415-390), Lysias (*fl.* 403-381), Isocrates (436-338), Isæus (*fl.* 390-353), and, above all, Demosthenes (384-322) with his contemporaries Æschines, Lycurgus, and others, and Demetrius of Phalerum (318), the last of whom marks the beginning of decay in the art. Philosophy shared the development of history and oratory, reaching a rare elevation in Plato (429-347), a rare comprehensiveness in Aristotle (384-322), the founders of the academic and peripatetic schools. Minor Socratic schools were the Cyrenaic, founded by Aristippus (370), the Megaric, founded by Euclid (399), and the Cynic, founded by Antisthenes. In the earlier part of the third century the rival schools of Epicurus (342-270) and of Zeno (344-260) became prominent.

From about the year 300 B.C. the literary decadence may be held to date; the period 300 to 146 being known as the Alexandrian. It comprises the learned poetry of Callimachus (who flourished at Alexandria 250 B.C.) and of Lycophron (260); the epic of Apollonius Rhodius (194); the didactic

poetry of Aratus (270) and Nicander (150); the pastoral poetry of Theocritus, Bion, and Moschus; the philology and criticism of Zenodotus (280), Aristophanes of Byzantium (200), Aristarchus (156), and Apollodorus (140); and the scientific works of Euclides (300), Archimedes and Eratosthenes (240). From 146 B.C. dates the Græco-Roman period in Greek literature, to which belong the historians Polybius (145 B.C.), Diodorus Siculus (40 B.C.), Dionysius of Halicarnassus (25 B.C.), Josephus, Arrian (A.D. 100), Appian (A.D. 140), and Herodian (A.D. 240); the biographies of Plutarch (A.D. 90), of Diogenes Laertius and of Flavius Philostratus (A.D. 235); the geographies of Strabo (A.D. 18) and of Pausanias (A.D. 160); the astronomy and geography of Ptolemy; the informative works of Athenæus (190), Ælian (220), and Stobæus (480); the rhetorical and literary works of Hermogenes (170), Aphthonius and Cassius Longinus (260); the medical works of Galen (160); the satirical works of Lucian (160) and of Julian (331-363); and the development of the Greek romance, best represented in Heliodorus (390), Achilles Tatius, and Chariton. During this period philosophy is in the main divided between Stoicism and Neo-Platonism, the former represented by Epictetus (A.D. 90) and Marcus Aurelius (170), the latter by Plotinus (240), Porphyry, and Iamblichus. In verse the best names were the fabulist Babrius (40), Oppian (180), Nonnus, Quintus Smyrnaeus (400-450), and Musæus (500). The special feature of the later Græco-Roman period was the rise of a Christian Greek literature represented by the patristic epistles, homilies, &c., and ecclesiastical histories, such as those of Eusebius, Socrates, and Sozomen. Among the chief writers were Justin Martyr, Origen, and Clement of Alexandria, Eusebius, Gregory of Nazianzus, Basil, Gregory of Nyssa, and Chrysostom. After 529 and until 1453 came the Byzantine period, of which the most important section was from about 850 to 1200. It was characterized by such writers as Eustathius, Photius, and Suidas, mainly occupied in the attempt to reduce to system a large, ill-ordered, and aimless erudition.

On the fall of Constantinople in 1453 the cultivated classes who still retained the pure Greek either perished or took to flight, or adopted the language of the conquerors. The popular Greek, however

survived, and despite its vulgarization and the modification of its grammatical forms and syntax, it cannot be said that Greek has been a dead language at any period since Homer. By some, modern Greek literature is dated from Theodore Prodromos (1143-1180), a monk and writer of popular verse, but the only names of importance until the close of the eighteenth century are those of Maximus Margunius (1530-1587), Anacreontic poet and letter writer; George Chortakes (seventeenth century), Cretan poet; Vincentius Kornaros, Cretan poet, author of *Erotocritos* (1756); Rhegas Pherraios (latter half of eighteenth century), patriotic poet; and Nicephorus Theotokes (1736-1800), writer on metaphysics and theology. At this period the patriotic movement found one outlet in the purification of the language and the development of a new literary impulse. The most important figure was that of Adamantios Korais or Coray (1748-1833), who did more than all his predecessors to found a literature. The poetry of the people is represented chiefly in the songs of the Klephts and other songs dating from the war of independence. At this period the war-songs of Rhigas were sung by the whole nation, and at a later period the two Soutsos, Panagios and Alexander, George Zalakostas (1805-1858), and others, earned distinction in the same kind of poetry. Among the most gifted of later writers are Rhisos Rangabé (1810-1892), distinguished in lyric, dramatic, and epic poetry, also as a novelist and a scholar; Dimitrios Bikelas, George Soures, Angelos Vlahos, and others.—BIBLIOGRAPHY: G. Murray, *History of Ancient Greek Literature*; W. C. Wright, *A Short History of Greek Literature*; J. A. Symonds, *Studies of the Greek Poets*; R. W. Livingstone, *The Greek Genius and its Meaning to Us*.

*Ancient Greek Art.*—The earliest architectural remains in Greece are pre-Hellenic in origin and Asiatic in character, Greek architecture proper dating from about the close of the eighth century B.C. The earliest-known example—the Doric temple at Corinth—belongs to about the middle of the seventh century B.C., and points to an Egyptian origin. Greek temples were for the most part rectangular, though the circular form sometimes occurs in the later periods of Greek art. In the simplest form of the rectangular temple (the *apertal*)

there were no columns; but, by an easy development from this, the side walls were carried out beyond those constituting the ends of the building, so as to form a porch. More complex forms were known as *peripteral*, where the columns were carried completely round the building; as *dipertal*, where a double range of columns surrounded it; and as *pseudo-dipertal*, where a double range of columns was placed in front and rear, but only a single range at the sides. The dipertal and pseudo-dipertal styles were seldom employed, the chief example of the dipertal having been the temple of Artemis at Ephesus, built by Ctesiphon in the sixth century B.C. Most of the famous temples in Greece were, however, peripteral. Three orders are distinguished in Greek architecture, according to the treatment of the pillars and of the entablature—the Doric, Ionic, and Corinthian. Of these the Doric is the most ancient, the most important examples in Greece, besides that already mentioned, being the temple at Egina (middle of the sixth century B.C.), the temple of Theseus at Athens (see Plate, *Architecture*, Vol. I.), and the Parthenon, constructed about 448 B.C. by the architects Ictinus and Callicrates, and adorned with unsurpassed sculpture by Phidias and his pupils. Next to these came the temple of Zeus at Olympia, the temple of Apollo at Bassæ, the frieze of which is in the British Museum, the temple of Athëna at Sunium, the great temple at Rhamnus, and those at Selinus in Sicily (middle of seventh century), Agrigentum, Segesta, and Pæstum. The oldest Ionic temple in Greece was probably the temple of Ilissus (about 488 B.C.), but the oldest of which remains are still visible is that dedicated to Hëra at Samos, and there are remains of a fine temple of this order at Teos. The most perfect example, however, is the Erechtheum at Athens. The Corinthian order, though Grecian in its origin, is represented amongst the Greek temples by a single example only, that of the Zeus Olympius at Athens; and even this temple belongs to the Roman period. The Choragic monument of Lysicrates at Athens also belongs to this order.

Greek sculpture has been divided into five principal periods, namely: (1) the Early (—580 B.C.); (2) the Eginetan (580-480 B.C.); (3) the Phidian (480-400 B.C.); (4) the Praxitelean (400-250 B.C.);

(5) the Decline (250 B.C. onwards). During the Early period the treatment was highly conventionalized, a single type serving for a variety of divinities and heroes, the hair being often entirely curled and gathered into a club behind, and the dresses of the female divinities being divided into a few perpendicular folds. Many of these characteristics survived in the Æginetan period, but a better knowledge of anatomy and greater freedom and boldness of treatment are apparent. The sculptures of the Thesaum form a connecting link between the Æginetan school and that of Phidias. To Phidias, besides his statues of Athena and Zeus, were due the designs for the sculptures of the Parthenon. To this age belonged the sculptor and architect Polykleitos (about 452–412 B.C.), whose statue of a youth holding a spear (*Doryphorus*) obtained the name of *The Canon*, as being a standard of form. About the same time the Boeotian sculptor Myron flourished, the famous *Discobolus* being a reproduction in marble of one of his bronzes. The Praxitelean period is characterized by greater grace and elegance in choice of subject and treatment, together with more of the sensual element making for ultimate decline. Praxiteles excelled in female figures, his *Aphrodite* at Cnidus in Caria being his most famous work. His rival, Scopas of Paros, was employed on the bas-reliefs of the Mausoleum at Halicarnassus, and was the sculptor of the famous group representing the destruction of the children of Niobe. In Lysippus of Sicyon, in the time of Alexander the Great, the Praxitelean school found its last great figure prior to the decline of the art.

*Painting* in Greece is said to have had its origin in Sicyon, and to have existed as mere outline and monochrome until Cimon of Cleonæ introduced variety in colouring, foreshortening, and a less rigid art. The earliest painters of renown were Micon of Athens (about 460 B.C.), and Polygnotus of Thasos and of Athens (about 463–430 B.C.); but a higher degree of illusion and realism appears to have been reached under Zeuxis and his rival Parrhasius, towards the close of the fifth century B.C. A greater name than any of these is that of Apelles, the friend of Alexander the Great, contemporaneously with whom flourished Protogenes of Caria, painter and statuary, and Nicias of Athens, a distinguished encaustic painter. Of the

work of these artists only a general conception can be formed from the mosaics and frescoes of Pompeii.—BIBLIOGRAPHY: E. A. Gardner, *Handbook of Greek Sculpture*; P. Gardner, *The Principles of Greek Art*; A. P. Laurie, *Greek and Roman Methods of Painting*.

**Greek Church, or Holy Oriental Orthodox Apostolic Church**, that section of the Christian Church dominant in Eastern Europe and Western Asia, especially in Turkey, Greece, and Russia. In the first ages of Christianity numerous Churches were founded by the Apostles and their successors in Greek-speaking countries: in Greece itself, in Syria, Egypt, Mesopotamia, Asia Minor, Thrace, and Macedonia. These were subsequently called Greek, in contradistinction to the Churches in which the Latin tongue prevailed. The removal of the seat of empire by Constantine to Constantinople, and the subsequent separation of the Eastern and Western Empires, afforded the opportunity for diversities of language, modes of thinking, and customs to manifest themselves, and added political causes to the grounds of separation. In 341, soon after the Synod of Antioch, the rivalry between the Bishop of Rome and the Bishop of Constantinople began to assume importance, and before 400, differences of doctrines with respect to the procession of the Holy Spirit appeared. The Council of Chalcedon in 451 accorded to the eastern bishop the same honours and privileges in his own diocese as those of the Bishop of Rome, and in 484 each bishop excommunicated the other. The title of *Œcumenical Patriarch* was assumed by John, Bishop of Constantinople, in 588, and in the following year the phrase *Filioque* ('and the Son') was added by the Latins to the Nicene creed (which now read "proceeding from the Father and the Son"), an addition to which the Greek Church was opposed. On several occasions the head of the one Church excommunicated the head of the other, and several reconciliations took place; the final separation took place in 1054, since which the Greeks have been severed from the Roman communion, though the Russo-Greek Church was not separated until the twelfth century. The Greek Church is the only Church which holds that the Holy Ghost proceeds from the Father only; the Roman Catholic and Protestant Churches deriving the Holy

Ghost from the Father and the Son. Like the Roman Catholic Church it has seven sacraments: Baptism, Communion, Confirmation, Penance, Orders, Matrimony, and Unction. But it is peculiar (1) in believing in baptism by threefold immersion, the chrism (confirmation) following immediately after it; (2) in adopting, as to the eucharist, the doctrine of the real presence and transubstantiation; but in ordering the bread to be leavened, the wine to be mixed with water, and both elements to be distributed to every one, even to children; (3) the parochial clergy are required to be married, but only once and to a virgin, and marriage must take place before ordination; widowed clergy are not permitted to retain their livings, but go into a cloister, where they are called *hieromonachi*. The lower clergy in the Greek Church consist of readers, singers, deacons, &c., and of priests or popes and protopopes or archpriests, who are the first clergy in the cathedrals and metropolitan churches. The lower clergy can rise no higher than protopopes, for the bishops are chosen from among the monks, and from the bishops are selected the archbishops, metropolitans, and patriarchs. The dignities of Patriarch of Constantinople, Alexandria, Antioch, and Jerusalem still subsist. The Patriarch of Constantinople still possesses the ancient authority of his see; the other three patriarchs exercise a very limited jurisdiction. In 1922 the Patriarch of Constantinople promulgated an official recognition of Anglican orders.—BIBLIOGRAPHY: J. M. Neale, *History of the Holy Eastern Church*; Dean Stanley, *History of the Eastern Church*.

Greeley, Horace (1811–1872), American journalist and politician. He commenced in 1834 to issue *The Weekly New Yorker*, which ran for seven years. *The Log Cabin*, another weekly, established by him in 1840, reached a circulation of 80,000, and gave him a reputation which ensured the success of his *Daily Tribune*, founded in 1841, and edited by him till his death. In 1872 he was nominated for the presidency in opposition to General Grant, but was defeated. Chief among his miscellaneous works are his *Recollections of a Busy Life* (1869) and *What I Know of Farming* (1871).

Green, John Richard (1837–1883), English historian. The publication in 1874 of his *Short History of the English People*

secured him immediate fame. It was followed by a larger edition of the same work entitled *A History of the English People* (1877–1880), a volume of *Stray Studies from England and Italy*, and *The Making of England* (1882). *The Conquest of England*, his last work, was published posthumously by his wife.

Green, Thomas Hill (1836–1882), English philosophical writer. Apart from his *Prolegomena to Ethics*, published posthumously in 1883, the bulk of his work was in the form of articles contributed to the *North British* and *Contemporary Reviews*. He was one of the strongest opponents of the English empirical school.

Green Algæ, or Chlorophyceæ, one of the principal sub-divisions of the Algæ, including the great majority of the freshwater forms together with a number of marine and a few terrestrial species. They are characterized by the pure green colour of their chromatophores and the relatively simple structure and small size (as compared with Brown and Red Algæ) of their thallus; the latter is most frequently filamentous, but unicellular types are common (e.g. *Chlamydomonas*, *Protococcus*), while on the other hand the green laver (*Ulva*) has a flattened leaf-like plant-body of considerable size. The reproductive methods are varied. Motile asexual spores (zoöspores) are frequent (except in Conjugatæ). Isogamous sexual reproduction is the rule, but oogamous types are found in most of the families. The oöspore of *Coelochæte* divides up into a clump of resting-cells covered by a protective sheath; this 'oöspore fruit' was formerly regarded as a simple type of sporophyte, but recent research has shown this view to be erroneous, as reduction of chromosomes takes place at the first division of the oöspore-nucleus. No true case of alternating generations is, in fact, known among Green Algæ. The leading families, with representative genera, are as follows: (1) Volvocales. Permanently motile. *Chlamydomonas* (unicellular, isogamous), *Volvox* (multicellular, oogamous). (2) Conjugatæ (*Akontæ*). No motile cells. Isogamy by means of a conjugation tube. *Spirogyra* (filamentous), *Desmids* (unicellular). (3) *Protococcales*. Unicellular or forming loosely-connected cell-colonies. Never oogamous. *Scenedesmus*, *Hydrodictyon*. (4) *Ulotrichales*. Filamentous (plate-like thallus in *Ulva*). Zoöspores general. Iso-



gamous or oogamous. Ulothrix, Ulva, Oedogonium, Cephaleros, Coleochaete. (5) Siphonales. Filamentous; filaments non-septate or with occasional septa, often interwoven. Usually isogamous. Vaucheria, Codium, Caulerpa, Cladophora, Struvea, Acetabularia.

**Greenaway, Kate** (1846-1901), English artist. She early became known by her charming designs for Christmas cards, children's books, &c., her quaint and pleasing figures of children dressed in old-fashioned costumes, and her flower designs, being specially noteworthy.

**Green Bay**, a city of Wisconsin, U.S.A., on the Fox River, near the head of Green Bay. It has a great trade in lumber, various flourishing industries, and an excellent harbour. Pop. 31,017.

**Greene, Maurice** (1696-1755), English composer. He was organist at St. Paul's, and then at the Chapel Royal, and held the chair of music at Cambridge. His collection of *Forty Select Anthems* is well known.

**Greene, Nathanael** (1742-1786), American general. In 1774 he joined the Kentish Guards as a private, and in May, 1775, he was appointed brigadier-general. He gained at once the confidence of Washington, was made major-general, and appointed to the command in New Jersey. At Trenton (1776) and Princeton (1777) he led a division. In 1780 he was appointed to the command of the southern army, and succeeded, after repeated defeats, in wresting Georgia and the Carolinas from the British.

**Greene, Robert** (1560-1592), English dramatist. He studied at St. John's College, Cambridge, and took his degree of B.A. in 1578, after which he travelled on the Continent. He graduated M.A. in 1583, lived a wild and profligate life, and died in poverty. His works consist of plays, poems, tales, and tracts. His chief romances are: *Pandosto* (1588), which supplied Shakespeare with the plot of *The Winter's Tale*, and *Menaphon* (1587). His chief plays are: *Alphonsus, King of Arragon*, an echo of *Tamérlane*; *Orlando Furioso*; *The Honourable Historie of Friar Bacon and Friar Bungay*, probably written to rival *Dr. Faustus*; and *The Scottish Historie of James IV., slain at Flodden*. This last play belies its name, as it is not a chronicle-play, but a dramatization of a story found in Cinthio's *Hecatommiti*.

Greene was not an accomplished playwright, but he drew characters with some cleverness, and developed his plots with no little success. He was unfortunate in all his doings, not least so because he attacked Shakespeare as "an upstart crow" in one of his latest pamphlets, *A Groat'sworth of Wit bought with a Million of Repentance* (1592). An edition of his plays and poems by Prof. Churton Collins appeared in 1905; a more recent edition of his works is that of T. H. Dickinson (1909).

**Green Earth**, an opaque, dull, olive-green, soft, earthy mass, consisting of silicate of iron and aluminium, with water. Some green earths are allied to glauconite and others to the chlorites.

**Green-ebony**, an olive-green wood obtained from the South American tree *Jacaranda ovalifolia*, nat. ord. Bignoniaceae, used for inlaid work and dyeing.

**Greenfinch, Green-linnet, or Green Grosbeak** (*Ligurinus chloris*), a common European bird of the finch family. It is found in hedges and gardens, and feeds on grain, seeds, or insects. The male is generally of a greenish-yellow and the female brown. Its eggs are bluish-white, spotted grey and brown. It is easily tamed. See Plate, *British Birds*.

**Greengage**, a variety of the plum, the *reine claupe* of the French, introduced into Britain by a family named Gage.

**Greenland**, an extensive island, the only colonial possession of Denmark, situated on the north-east of the continent of North America. It is more than 1700 miles in length, and at its broadest part 700 miles in width. It has an area of about 827,300 sq. miles. The interior is uninhabitable, and all the villages are confined to the coasts, which are lined with numerous islands and deeply penetrated by fiords. The Danish colony extends north, on the western coast, to the Bay of Disco, in lat. 69° N. Cultivation is confined to the low shores and valleys, where grassy meadows sometimes occur with stunted shrubs and dwarfed birch, alder, and pine trees. No cereals can be grown, and turnips and cabbages are exceedingly small. The inhabitants are largely dependent upon hunting and fishing. Whale blubber and seal oil are used as fuel. The seas abound in fish, the whale and cod fisheries being of special importance. Sea-fowl are abundant in summer, and

largely killed. The chief mineral product is cryolite, but graphite and miocene lignitic coal are also found. Oil, eider down, furs, and cryolite are exported. The population, which is chiefly Eskimo, numbers 14,355 (274 Danes). For administrative purposes Greenland, or rather its coast, is divided into two inspectorates of North and South Greenland. The capital is Godhaven, on Disco Island, but the largest settlement is Sydproven (pop. 901).

Greenland was discovered by an Icelandic named Gunnbjörn about 876 or 877, and was colonized from Iceland about the end of the tenth century. In 1264 it was politically united with Norway, and about the middle of the fourteenth century possessed two flourishing colonies, which, however, gradually disappeared from history. In the reign of Elizabeth Frobisher and Davis rediscovered the coast, but nothing was done to explore it until the Danish Government in 1721 assisted Hans Egede, a clergyman, to establish a European mission settlement, Good Hope (*Godhaab*), which was successfully carried on by him and his son. Whale fisheries were established on the coast by the English and Dutch about 1590. The interior of the country (in the south) was first crossed from east to west by Nansen in 1888. Further exploration was carried out by Peary (1892), Nordenskiöld (1883), Garde (1893), Mylius Erichsen (1906–1908), Mikkelsen (1909–1912), and Knud Rasmussen (1916–1918).—Cf. F. Nansen, *The First Crossing of Greenland*.

**Greenock**, a seaport-town of Renfrewshire, Scotland, on the southern shore of the estuary of the Clyde, about 20 miles west by north of Glasgow. It is built partly on the sea margin and partly on the heights which rise behind. There are several notable buildings. The manufacturing industries include sugar-refineries (cane and beet), shipbuilding yards, iron-foundries and machine-shops; chemical works; worsted, woollen, and paper mills; grain, saw, and sundry other mills; jute and bagging factories, roperies, and sail-making establishments. Greenock carries on a considerable coasting and foreign shipping trade, especially with the East and West Indies, America, and Australia. Almost all coasting vessels trading from Glasgow call at Greenock, and Prince's Pier is a centre of the tourist-steamer

traffic. The docks are spacious and possess every accommodation for the largest ships, including graving-docks and hydraulic and steam cranes. Unrefined sugar has long been the most valuable import. Pop. (1931), 78,948.

**Green Paints.** See *Paints and Pigments*.

**Green River, U.S.A., Kentucky**, flows generally west and north-west, and enters the Ohio 200 miles below Louisville. It is navigable for boats for about 200 miles.

**Greensand**, a sand rich in glauconite. The name is also used for two series of strata occurring in the south-east of England, the Isle of Wight, &c., consisting chiefly of sands, with clays, limestones, and chert bands.

**Greensboro**, a city of North Carolina, U.S.A., with numerous educational institutions. It has manufactures of cotton goods, machinery, carpets, &c., and trades in tobacco, maize, lumber, and cotton. Pop. 43,525.

**Greenshank**, a well-known species of sandpiper (*Totanus glottis*), about 12 inches long, with a prettily marked body and green legs and toes. It sometimes breeds in the north of Scotland, and is a common British visitor.

**Greenville**, a city of South Carolina, U.S.A. It is an educational centre, and carries on iron-founding and the manufacture of wagons and cotton goods. Pop. 23,127.

**Greenwich**, a borough of London, on the right bank of the Thames, about 5 miles south-east of London Bridge. There are extensive iron-foundries and engineering works, barge and boat-building yards, boiler works, mast-, block-, and sail-works, telegraph cable works, roperies, chemical factories, &c. The object of greatest interest is the magnificent hospital, the oldest portion of which was originally a palace of Charles II. It was converted to its charitable purpose in the reign of William and Mary. As a hospital for aged and disabled seamen of the navy, it was opened in 1705, and subsequently accommodated about 3000. In 1865, however, it ceased to be an asylum for seamen; since 1873 it has been the seat of the Royal Naval College, for the education of naval officers. Adjoining it are the Royal Naval School for boys, and an infirmary for sick and disabled seamen. The celebrated observatory of Greenwich,

erected by Charles II for Flamsteed, stands upon an eminence in Greenwich Park. The longitude of all British maps and charts, and also of those issued by the Government of the United States of America, as well as many of those published in other countries, is computed from this observatory, which is  $2^{\circ} 20' 23''$  w. from the observatory of Paris, and  $18^{\circ}$  E. from the meridian of Ferro. Pop. (1931), 100,879.

**Greenwich**, a town of Connecticut, U.S.A., on Long Island Sound, 27 miles north-east of New York. It is a residential district and a holiday resort. Pop. 18,000.

**Gregorovius**, Ferdinand (1821–1891), German historian. His principal work is his *History of Rome in the Middle Ages* (1859–1873, 8 vols.). This monumental work is not only a history of Rome, but also of the Papacy and the Middle Ages.

**Gregory** (1739–1821), Patriarch of Constantinople. In 1798, and again in 1806, he was accused of intriguing for the freedom of Greece, and twice banished to Mount Athos. In 1821, when the Greek insurrection broke out in the Morea, his native country, he became once more an object of suspicion to the Porte, and was seized as he left the church on the first day of the Easter festival and hanged in his robes of office before the church gate.

**Gregory**, the name of thirteen Popes, of whom we need notice only the following:—**Gregory I**, called also the *Great* (540–604). On the death of Pelagius in 590 he was chosen his successor. He displayed great zeal for the conversion of heretics, sending missionaries to Sicily, Sardinia, Lombardy, England, &c., as well as for the advancement of monachism and the enforcement of clerical celibacy. The works ascribed to him are very numerous; his genuine writings consist of a treatise upon *Pastoral Duty*, *Letters*, *Scripture Commentaries*, &c.—**Gregory VII** (*Hildebrand*) (1020–1085). On the death of Alexander II (1073) he was raised to the Papal chair. His chief aim was to found a theocracy in which the Pope should be the sovereign ruler, in political as well as ecclesiastical matters. He therefore prohibited simony and the marriage of priests (1074), and abolished lay investiture (1075). The Emperor Henry IV refused to submit to the decree which abolished lay investiture, and caused a sentence of deposition to be passed against

the Pope by a council assembled at Worms. The Pope, in return, excommunicated the emperor, and Henry, finding himself in difficulties, went to Italy and submitted at Canossa (1077) to a humiliating penance, and received absolution. After defeating Rodolph of Suabia, however, Henry caused the Pope to be deposed by the Council of Brixen, and Antipope Clement III to be elected in 1080. Gregory passed three years as a prisoner in the castle of St. Angelo, and though finally liberated by Robert Guiscard, he was obliged to retire under the protection of Guiscard to Salerno, where he died.—**Gregory XIII** (*Ugo Buoncompagno*) (1502–1585). He was chosen successor of Pius V in the papedom in 1572. He permitted the Cardinal of Lorraine to make a public thanksgiving for the massacre of St. Bartholomew, encouraged plots against Queen Elizabeth, and incited Philip II to attack her.

**Gregory**, James (1638–1675), Scottish mathematician and inventor of the reflecting telescope. In 1663 he published *Optica Promota*, explaining the idea of the telescope which bears his name. He spent some years in Italy, and published at Padua in 1667 a treatise on the *Quadrature of the Circle and Hyperbola*. He became professor of mathematics at St. Andrews in 1668, and at Edinburgh in 1674.

**Gregory**, James (1753–1821), Scottish physician. In 1776 he was appointed professor of the institutes of medicine at Edinburgh. In 1780 he published his *Conspectus Medicinæ Theoreticæ*.

**Gregory**, John (1724–1773), Scottish physician. He was professor of the practice of physic at Edinburgh. His works include *Elements of the Practice of Physic* and *A Father's Legacy to his Daughters*.

**Gregory of Nazianzus** (*Gregorius Nazianzēnus*) (329–389), a Father of the Greek Church. He began to preach in 362, and between 365 and 374 was associated with his father in the bishopric of Nazianzus. About 378 or 379 he went to Constantinople to oppose the Arians, and was appointed bishop of that see by Theodosius in 380. His works consist of letters, sermons, and poetry. His eloquence is nearly on a level with that of Basil and Chrysostom.

**Gregory of Nyssa** (c. 331–c. 396), a Father of the Greek Church. He took a prominent part in the Councils of Con-

stantinople from 381 to 394. His works consist of dogmatic treatises, Scripture commentaries, sermons, and letters.

**Gregory of Tours** (*Gregorius Florentius*) (538–594), historian of Gaul. He became Bishop of Tours in 573. His *Historia Francorum* is a valuable chronicle of sixth-century events.

**Gregory's Mixture**, a popular stomachic and aperient medicine, consists of two parts of rhubarb, six of magnesia, and one of ginger. It may be used with benefit occasionally, but not systematically.

**Greiffenhagen**, Maurice (1862–1931), British artist and portrait-painter. He was appointed headmaster of the Life Department, Glasgow School of Art, in 1906, became A.R.A. in 1916, and R.A. in 1922.

**Greifswald**, a town of Prussia, Pomerania, on the navigable River Rick, about 8 miles above its entrance into the Baltic. It contains a university founded in 1456, and has manufactures of machinery, oil, paper, and tobacco, and a considerable shipping trade. Greifswald was one of the Hanse towns. Pop. 24,679.

**Greiz**, a town of Thuringia, Germany, in a valley on the right bank of the Elster. It is a centre of the textile industry. Pop. (1925). 37,533.

**Grenada**, one of the British West Indian Islands, the most southerly of the Windward group. It lies 90 miles north of Trinidad, and has an area of 133 sq. miles. The island is traversed by forest-covered volcanic ranges, in the valleys of which are alluvial tracts of great fertility. In the centre of the island is the lake of Grand Etang, and numerous streams give a plentiful supply of excellent water. The climate is extremely healthy, though it is often oppressively hot on the lowlands. The sugar-cane is now hardly grown in Grenada, the most important natural product being cocoa. The lime and other fruits, spices of all kinds, and rubber are also grown, and the chief exports are cocoa, spices, fruit, timber (mahogany, white cedar, locust), and turtle-shell. The total value of exports in 1922 was £271,392, and of imports £250,413. There are excellent roads in all parts of the island. The capital is St. George's. Grenada, including some of the small Grenadines Islands (q.v.), has a Lieutenant-Governor and a legislative

council of seven official and eight unofficial members. The island was discovered by Columbus in 1498, colonized about the middle of the seventeenth century by the French, taken by the British in 1762, recaptured by the French in 1779, and restored to Britain in 1783. English and a French patois are spoken. Pop. 67,473.

**Grenadines**, a chain of small islands and rocks, West Indies, between the Islands of Grenada and St. Vincent. Some of them are attached to the government of St. Vincent, and some (including Carriacou, the largest) to that of Grenada. They produce coffee, indigo, cotton, and sugar. Pop. about 7000.

**Grenfell**, Sir Wilfred Thomason (1865– ), British physician and surgeon. He fitted out the first hospital ship for the North Sea fisheries, and did valuable work for the Mission to Deep Sea Fishermen. In 1892 he went to Labrador, where he has since been engaged in missionary, medical, and exploration work. He was made a K.C.M.G. in 1927. He has published several books.

**Grenoble**, a fortified town of Southern France, capital of the department of Isère, situated on both banks of the River Isère. It has a cathedral, a noteworthy church (St. André), and a famous university founded in 1339. The manufactures consist of gloves, linen goods, liqueurs, and leather. Pop. 77,409.

**Grenville**, George (1712–1770), British statesman. He became Treasurer of the Navy in 1754; Secretary of State and subsequently First Lord of the Admiralty in 1762; First Lord of the Treasury and Chancellor of the Exchequer in 1763. In 1763 he introduced a scheme of colonial taxation, and in 1764 proposed a stamp tax to be levied in the American colonies, which was one of the causes of the American War of Independence.

**Grenville**, Sir Richard (1541–1591), British naval commander. In 1591 he was in command of the *Revenge* of 500 tons and 250 men, as vice-admiral under Lord Thomas Howard, who was sent to the Azores for the purpose of intercepting homeward-bound Spanish treasure-ships. Suddenly the Spaniards appeared with an overwhelming force of men-of-war. Sir Richard was cut off from his countrymen, and instead of surrendering determined to fight to the last. For fifteen hours he kept



up a desperate resistance, and was mortally wounded before he surrendered.

**Grenville**, William Wyndham, Lord (1759-1834), English statesman. In 1783 he was appointed Paymaster-General of the Army; in 1789 he became Speaker, and in the same year Secretary of State for the Home Department. From 1791 till Pitt's resignation in 1801 he held the post of Foreign Secretary. He became the head of a coalition ministry, including Fox and Grey, 1806. This ministry resigned in 1807, after having passed an Act for the abolition of the slave-trade. He did not again take office.

**Gresham**, Sir Thomas (1519-1579), London merchant. In 1556 he planned and erected at his own expense an exchange (afterwards called by Elizabeth the Royal Exchange) for the merchants of London, in imitation of that of Antwerp. He founded in 1575 Gresham College, London, in which courses of lectures are given.

**Gresham's Law**, the principle of economics that bad money drives out good. See *Money*.

**Gresset**, Jean Baptiste Louis (1709-1777), French poet. His chief work is a small poem full of graceful badinage called *Vert Vert*.

**Gretna Green**, a village of Scotland, in Dumfriesshire, near the Border, 8 miles north of Carlisle, for nearly a century notorious for the celebration of the marriages of fugitive lovers from England. To conclude a lawful (though irregular) marriage in Scotland it is only necessary for an unmarried couple to go and declare themselves man and wife before witnesses, and it was in this way that these runaway couples were married; but such marriages were put an end to, in 1856, by an Act declaring invalid any irregular marriage in Scotland unless one of the parties has resided in Scotland for twenty-one days next preceding such marriage. During the European War a cordite factory employing 16,000 hands was erected at Gretna, and a large township sprang up. On the cessation of hostilities this factory was gradually closed down, and the greater part of the plant was ultimately sold by public auction.

**Greuze**, Jean Baptiste (1726-1805), French painter. Among his works the following may be mentioned: *The Village Marriage*, *The Wicked Son Punished*, *The Broken Pitcher* (all in the Louvre); *The*

*Broken Mirror*, *Innocence* (in the Wallace Collection, London); *The Dead Canary* (National Gallery, Edinburgh).

**Greville**, Fulke. See *Brooke, Lord*.

**Grey**, Charles, Earl (1764-1845), English statesman. On the accession of the Grenville ministry in 1806, Grey was made First Lord of the Admiralty, and on the death of Fox succeeded him as Secretary for Foreign Affairs and leader of the House of Commons. The death of his father in 1807 raised him to the House of Peers, and from this period up to 1830 he headed the opposition in the Lords. On the accession of William IV and the retirement of the Wellington ministry, Earl Grey was summoned to office. The great event which marks his administration is the passing in 1832 of the First Reform Bill.

**Grey**, Sir George (1812-1898), British statesman and colonial governor. In 1841 he was appointed Governor of South Australia, becoming Governor of New Zealand in 1846. From 1854 to 1861 he was Governor of Cape Colony. From 1861 to 1867 he was again Governor of New Zealand. Subsequently (1877-1880) he was Premier of New Zealand. Besides writing an account of his Australian explorations, he published *Polynesian Mythology* and *Ancient Traditional History of the New Zealand Race*.

**Grey**, Lady Jane (1537-1554), Queen of England for nine days. She was the daughter of Henry Grey, Marquess of Dorset, afterwards Duke of Suffolk, by Frances, daughter of Charles Brandon, Duke of Suffolk, and Mary, younger sister of Henry VIII. She was married to Lord Guildford Dudley in 1553. Edward VI, who died in 1553, was induced on his death-bed to settle on her the succession to the crown. The Council endeavoured to keep his death secret, with a view to securing the persons of the princesses, Mary and Elizabeth, and when Mary discovered the design the Council proclaimed Lady Jane queen. On the approach of Mary, however, the Council deserted Lady Jane, and Mary was proclaimed queen. Jane was confined to the Tower, and was beheaded 12th Feb., 1554, after her father had taken part in Wyatt's rebellion.

**Greymouth**, a port of entry of New Zealand, on the west coast of South Island, in a district where coal is mined and gold obtained. The harbour has a depth of 20 feet at high water. Pop. 8000.

**Grey of Falloдон**, Edward, first Viscount (1862– ), British statesman. He was educated at Winchester and at Balliol College, Oxford. In 1885 he entered Parliament as a Liberal member for Berwick-on-Tweed, and continued to sit for this constituency till 1916. He was appointed Under-Secretary for Foreign Affairs in 1892 in the Rosebery Cabinet. In 1905 he became Secretary of State for Foreign Affairs in the Campbell-Bannerman ministry, retaining this office till 1916. During his tenure of office the Triple Entente, uniting Great Britain, France, and Russia, was developed, an Anglo-Russian agreement was concluded in 1907, and the Peace of London, putting an end to the Balkan War, was signed on 30th May, 1913. He failed, however, to bring about more cordial relations with Germany, and in 1911, during the Morocco dispute supported France against Germany. During the twelve days preceding the outbreak of the European War he did everything he could to preserve peace, but when he saw that war was unavoidable he did not hesitate to commit his country to the general struggle. In an historic speech, delivered on 1st Aug., 1914, he defined Britain's attitude, and the Commons decided to stand by France against Germany. He resigned in Dec., 1916. He has published *Twenty-five Years, 1892–1916* (1925), *Falloдон Papers* (1926), and *The Charm of Birds* (1927).

**Greytown**. See *San Juan del Norte*.

**Grieg**, Edvard Hagerup (1843–1907), Norwegian musical composer. He studied at Leipzig and at Copenhagen, and, after spending a few years in Christiania, received a Government pension which enabled him to settle in Bergen and devote his whole time to composition. His most notable works are the music to Ibsen's play *Peer Gynt*, and his refined and lyrical renderings of Norwegian folk songs and dances.

**Grillparzer**, Franz (1791–1872), German poet and dramatist. He was the author of lyrical and other poems, a novel, and travels, and of the dramas *Sappho*, *Das Goldene Vliess*, and *Des Meeres und der Liebe Wellen*. Perhaps the finest of his productions is the historical drama of *König Ottokars Glück und Ende*.

**Grimm**, Friedrich Melchior, Baron (1723–1807), German man of letters. He lived mostly in Paris and wrote in French.

Having finished his studies, he went to Paris and there became acquainted with Jean Jacques Rousseau, Diderot, D'Alembert, D'Holbach, and other Parisian philosophers. His *Correspondance Littéraire* possesses great literary and historical value.

**Grimm**, Jakob Ludwig (1785–1863), German philologist. He wrote on German mythology, German legal antiquities, the history of the German language, and published old German poems. His two greatest works, both unfinished, are his *Deutsche Grammatik* (German Grammar, vols. i–iv, 1819–1837), and his *Deutsches Wörterbuch* (German Dictionary), commenced in 1852, in conjunction with his brother Wilhelm, and being gradually completed by eminent scholars. He also published, in company with his brother, the *Kinder- und Hausmärchen*, one of the most popular collections of juvenile fairy tales.

**Grimm**, Wilhelm Karl (1786–1859), German philologist, brother of the preceding. He devoted himself especially to the German mediæval poetry, and published a treatise, *Ueber die deutschen Runen*, a translation of *Aldänische Heldensieder*, and *Balladen und Märchen*, all with valuable introductions and disquisitions.

**Grimm's Law**. See *Philology*.

**Grimsby**, a seaport and county borough, England, county of Lincoln, on the Humber. The docks (water area, 100 acres) can accommodate vessels of 4000 tons. Grimsby is one of the largest fishing ports in the world, and over 800 trawlers are registered there. Industries include tanning, ship-building, and rope-making. There is a large trade with Continental ports. Pop. (1931), 92,463.

**Grimstad**, a port of Norway, on the Skagerrak, 25 miles north-east of Christiansand. It has an excellent harbour, admitting ships drawing 30 feet at all states of the tide. The chief export is timber. Pop. 3000.

**Grindelwald**, one of the most beautiful of the upper Alpine valleys of Switzerland, about 36 miles south-east of Berne, containing two immense glaciers. The village of Grindelwald has about 3500 inhabitants.

**Grinding**, a general term for operations whereby materials are milled, crushed, pulverized, shaped, or reduced in size by the forces of attrition, abrasion, and

impact. Rocks and minerals may be disintegrated between heavy steel jaws. For fine grinding or milling gold-bearing quartz, batteries of stamps are used. Cereals may be disintegrated to a very fine state of division by the impact of quickly-moving projections of rotating discs, between which the grain is passed. Materials are reduced in size by grinding with loose abrasives or abrasive wheels. Metals are shaped or ground by abrasive wheels associated with many specialized machines—universal, cylindrical, internal, surface, tool, and drill. The grains or grits of abrasive of various grades are held together by vitrified bonds of fused clay, silica bonds of clay and water-glass fused at a lower temperature, and elastic bonds containing shellac and gums. *Lapping* is the operation of reducing sizes by very small amounts.—Cf. R. B. Hodgson, *Emery Grinding Machinery*.

**Griqualand East**, a district of Cape Province, South Africa, lying south of Natal; fertile and suited for stock-raising. Area, 6602 sq. miles; pop. 264,827 (including 7065 whites).

**Griqualand West**, a district of Cape Province, north of the Orange River and west of the Orange Free State; area, about 15,179 sq. miles. The prevailing character of the surface is that of undulating grassy plains suitable for grazing. In 1870 large finds of diamonds in the Vaal River basin began to attract wide notice, and in 1871 Waterboer, the Griqua chief, ceded all his rights to the British Government, and the territory was incorporated with Cape Colony. The chief centre of the diamond-mining industry, and the seat of government, is Kimberley. The Griquas are a mixed race sprung from the intercourse of the Boers with Hottentot women. Pop. 108,500 (including 32,570 whites).

**Grisi**, Giulia (1811–1869), Italian opera-singer. After having made her début in Rossini's *Zelmira*, she appeared at Milan as Norma. She acquired great celebrity at Paris, in England, and America, and was at the height of her fame between 1834 and 1840. In 1836 she married Mario, the great tenor singer.

**Gris-Nez**, Cape, a headland, north-west extremity of France, department of Pas-de-Calais, the nearest point of the French shore to that of Britain, the distance being barely 21 miles. It has a revolving light, 195 feet high.

**Grisons**, the largest canton of Switzerland, bordering on Austria and Italy; area, 2773 sq. miles. It consists almost entirely of mountain chains, and may be regarded as embracing three great valley districts, of which the Upper and Lower Engadine (Inn Valley) attain considerable breadth. The Inn, which flows to the Danube, and the Vorder and Hinter Rhine are the principal rivers. The lakes are numerous. The canton is in general pastoral, feeding large numbers of cattle and sheep. The mountain forests supply much timber. The canton was admitted into the Confederation in 1803. Both the Protestant and the Roman Catholic religion are established. The language of the public Acts is German, and the people speak German, Romansch, or Italian. The capital is Chur. Pop. 119,854.

**Groat**, an English silver coin, coined by Henry III in 1249, and by Edward III in 1351. It was equal to fourpence in value. A coin of this value, the *fourpenny-piece*, was revived in 1835, but none have been struck since 1856, and all are now withdrawn from circulation.

**Grodno**. See *Gardinas*.

**Groningen**, a town of Holland, capital of a province of the same name, situated on the River Hunse, here converted into a canal. It has numerous canals, one of which connects with the port of Delft. The harbour at Groningen is only for coasting vessels, but the trade is good. The principal edifices are the cathedral and the university. It has sawmills, fulling mills, and manufactures of white lead, soap, and oil. Pop. 94,092.—The province forms the north-eastern portion of Holland; area, 881 sq. miles; pop. 374,320.

**Gronovius**, the name of several Dutch classical scholars.—(1) Johann Friedrich (1611–1671). His editions of Livy, Statius, Justin, Tacitus, Gellius, Phædrus, Seneca, Sallust, Pliny, and Plautus are valuable.—(2) His son Jakob (1645–1716) edited Tacitus, Polybius, Herodotus, Pomponius Mela, Cicero, and Ammianus Marcellinus, and compiled a *Thesaurus Antiquitatum Græcarum*.—(3) His son Abraham (1694–1775) edited Justin, Pomponius Mela, Tacitus, and Ælian.

**Groote Eylandt**, the largest island in the Gulf of Carpentaria, north of Australia, belonging to South Australia; greatest length and breadth, 40 miles each.

**Gros**, Antoine-Jean, Baron (1771–1835),

French historical painter. He attracted the notice of Napoleon by his picture *The Victor of Arcola*. He painted battle scenes and a number of portraits; but his chief work is probably the cupola of St. Geneviève at Paris. The rise of the Romantic school and the criticism levelled at his work so affected his mind that he drowned himself in the Seine.

Grosbeak, a general popular name for several finches and other perching birds possessing unusually large beaks, e.g. the hawfinch.

Grose, Francis (1731-1791), English antiquary. In 1773 he commenced the publication in numbers of his *Views of Antiquities in England and Wales*. In 1789 he made a tour in Scotland. *Tam o' Shanter* was written for him, and he was the original "chield amang you taking notes". Captain Grose also wrote a *Treatise on Ancient Armour and Weapons*.

Grossenhain, a town in Saxony, 20 miles north-west of Dresden, on the left bank of the Röder. Woollen and cotton goods are manufactured. Pop. 12,200.

Grosseteste, Robert (1175-1253), English statesman and prelate. He studied first at Oxford, and then went to Paris, where he mastered the Hebrew and Greek languages. On his return to England he became lecturer in the Franciscan school at Oxford, and acquired a great reputation for his linguistic abilities and his skill in logic. In 1235 he was appointed Bishop of Lincoln. His writings, few of which have been published, are very voluminous.

Grosseto, a province of Tuscany, Italy; area, 1735 sq. miles; pop. (1928), 170,455. Being mountainous and marshy, it is little adapted for cultivation. Its capital, Grosseto, on the Ombrone, has a trade in agricultural produce. Pop. (commune) (1928), 21,565.

Gross Glockner, a mountain of the Noric Alps, between Tirol, Carinthia, and Salzburg. It is 12,350 feet high.

Grossulaceæ, or Grossulariaceæ, a tribe of plants of the nat. ord. Saxifragaceæ, comprehending the gooseberry and currant of gardens, and consisting, in fact, of only one genus, *Ribes*; natives of most parts of the world except Africa and the tropics.

Grosswardein, German name of the Romanian town of *Oradia Mare* (q.v.).

Grote, George (1794-1871), English historian and politician. In 1810 he entered

his father's banking establishment as a clerk. In 1832 he was elected a member of Parliament for the city of London. In 1846 appeared the first two volumes of his *History of Greece*. The remaining ten volumes followed in rapid succession, the final volume being published in 1856. The work terminates with the death of Alexander the Great, and as a whole is a monument of erudition. It is, however, not strictly impartial, and some of it has been rendered obsolete by more recent discoveries, especially by the discovery of Aristotle's *Constitution of Athens*. In 1865 he published *Plato and the Other Companions of Sokrates*, and was engaged at the time of his death on an elaborate treatise on *Aristotle and the Peripatetics*.

Grotius, or De Groot, Hugo (1583-1645), Dutch scholar. After several vicissitudes he went to Stockholm, entered the service of Queen Christina, and was appointed Ambassador to France in 1635. His greatest work is *De Jure Belli et Pacis* (1625), on the fundamental principles of international law. He also wrote *Annales et Historiæ de Rebus Belgicis et Annotationes on the Old and New Testaments*.—Cf. C. Butler, *Life of Hugo Grotius*.

Grottaglie, a town of Italy, 32 miles south-west of Brindisi. Pottery is made, silk is woven, and there is a trade in grain, fruit and wine. Pop. 12,000.

Grouchy, Emmanuel, Marquis de (1766-1847), French general. In the war with Prussia in 1806, and Russia (1807), and at Wagram, he acquired increased renown. In 1815 he defeated Blücher at Ligny. Having been ordered to follow the Prussian retreat, he was unable to aid Napoleon at Waterloo.

Ground-annual, in Scottish law, the rent paid for a piece of ground that is built upon, to one who holds the ground in feu. It may thus be a perpetual annuity. A vendor often prefers a ground-annual to a lump sum. It is similar to the English term *Ground-rent*.

Ground Dove, or Ground Pigeon, a name of various species of pigeons (family *Peristeridae*) including American mourning doves, white-winged doves, and others.

Ground Ivy (*Glechoma hederacea*), a common British plant of the order *Labiata*, with a creeping stem and purple flowers.

Ground-nut, a term which denotes the seeds or pods of the *Arachis hypogæa*,



or the tubers of certain umbellifers (earth-nuts). The plant is extensively cultivated in tropical countries. The nuts have a flavour similar to almonds, and yield an oil that may be used for olive-oil. See *Earth-nut*.

**Ground-rent**, in English law, is the rent paid to a landowner by a person for the use of ground on which buildings are erected. The usual arrangement is for a specified time, not more than nine hundred and ninety-nine years. On the expiry of the specified period the buildings become the property of the ground-landlord.

**Groundsel** (*Senecio vulgaris*), a European weed belonging to the nat. ord. Composite. The plant has an acid taste, and the hog and goat are the only animals that will eat it. Its seeds are popular with small birds.

**Grouse**, the general name of the game-birds of the sub-family Tetraoninae. The

grouse or ptarmigan. The black grouse (*Lyrurus tetrix*) is about the size of a common fowl. The female is commonly called *grey hen*, and the male *black cock*. The red grouse, *Lagopus scoticus*, also called *moorfowl*, is the only bird peculiar to Britain, and is important as a game-bird. It pairs in the spring; the female lays eight or ten eggs. As soon as the birds are full grown they unite in flocks. There are many species of North American grouse, the most remarkable of which is the *prairie-hen* (*Tympanuchus americanus*).

**Grove**, Sir George (1820-1900), English writer. He was long secretary to the Crystal Palace Company, and did much for the popularizing of classical music in connexion with its concerts. For some years he edited *Macmillan's Magazine*, and he was editor of, and a contributor to, the great *Dictionary of Music*, published between 1878 and 1889.

**Grozny**, a town of Russia, province of Terek, in the Caucasus Mountains. There are naphtha beds in the vicinity, and the town has large petroleum refineries. Pop. (1926), 68,658.

**Grugru**, the larva of the *Calandra palmarum*, or palm weevil, found in the tropical parts of America. When cooked it is considered a great delicacy.

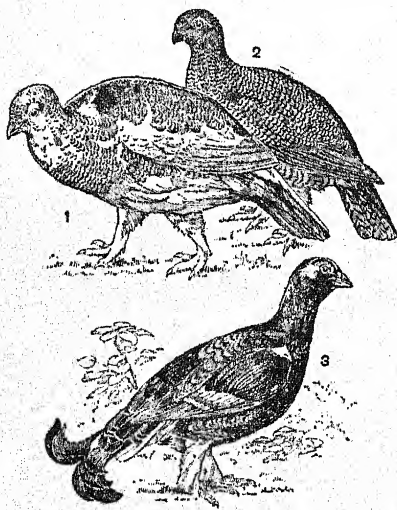
**Grünberg**, a town in Silesia, surrounded by vineyards, which produce large quantities of wine. It has textile industries. Pop. 23,000.

**Grundy**, Mrs., the personification of the conventional proprieties, or of local public opinion. The name first appeared in *Speed the Plough* (1798), a comedy by Thomas Morton (1764-1838), where Mrs. Grundy was an imaginary *censor morum* to whom Dame Ashfield continually appealed. She was worshipped in Erewhon under the anagrammatized form of her name Ydgrun.

**Grundy**, Sydney (1848-1914), English dramatist. Among his numerous plays are: *A Fool's Paradise* (1890), *Sowing the Wind* (1893), *The Degenerates* (1899), *Business is Business* (1905), *A Fearful Joy* (1908), &c. Many of his plays were clever adaptations from the French, such as *The Bells of Haslemere*, and *A Pair of Spectacles*.

**Gruyères**, a village, Switzerland, canton of Fribourg. It gives its name to the well-known cheese made from a mixture of goats' and ewes' milk. Pop. 1400.

**Grysbok**, a South African antelope about 3 feet long and 1½ feet high, of



Grouse

1, Ptarmigan (*Lagopus mutus*). 2, Red grouse (*Lagopus scoticus*). 3, Black grouse or black cock (*Lyrurus tetrix*).

largest species is the *capercaillie* or *wood grouse* (*Tetrao urogallus*). (See *Capercaillie*.) Other British species are the black grouse, the red grouse, commonly called simply the grouse, and the white

a reddish brown colour, hunted for its flesh.

**Guacharo**, or **Oil-bird**, *Steatornis caripensis*, a bird of the family Steatornithidæ, found in Trinidad and parts of South America. The Indians value it for its oil.

**Guadalajara**, a town, Spain, capital of the province of same name, on the Henares. It has manufactures of woollens, soap, and earthenware. Pop. 12,176.—The province—area, 4676 sq. miles—is mountainous, or forms part of an elevated plateau. Pop. 204,273.

**Guadalajara**, a city of Mexico, capital of the state of Jalisco, in the fruitful valley of Atemajac, on the Rio de Santiago. It has a cathedral, a university, and a mint. Various manufactures are carried on, silversmiths' and goldsmiths' wares, paper, leather, hats, pottery, and cloth. Pop. (1921), 143,376.

**Guadalquivir**, a river, Spain, which rises in the frontiers of Murcia, and falls into the Atlantic. Its course is 250 miles, of which 70 miles are navigable.

**Guadalupe**, a river of Texas, U.S.A. It divides about 20 miles from its mouth, one branch flowing to the Gulf of Mexico, the other joining the San Antonio. The total length is 250 miles.

**Guadeloupe**, a French colony, one of the French West Indies, Lesser Antilles, composed of two portions, separated by a narrow arm of the sea called Rivière Salée (salt river). The western and larger portion is Basse-terre, or Guadeloupe Proper, while the eastern portion is called Grandeterre. Guadeloupe Proper is of volcanic formation. Grande-terre, on the other hand, is generally flat, and of coral formation. Guadeloupe is watered by a number of small streams which become dry in summer. Grande-terre has only a few springs of brackish, undrinkable water. The climate is hot and unhealthy, with a remarkably humid atmosphere, and hurricanes are frequent and destructive. The soil is fertile. The chief exports (amounting annually to about 80,000,000 francs) are sugar, coffee, dye, and cabinet woods, pepper, manioc, and tobacco. The chief town is Basse-terre. Discovered by Columbus in 1493, the island was alternately in the possession of France and Great Britain, transferred to Sweden in 1813, and restored to France in 1814. Area of Guadeloupe, 532 sq. miles (with dependencies,

which include part of St. Martin (q.v.), 688 sq. miles). Pop. 229,839.

**Guadiana**, a river of Spain, which rises in New Castile, forms part of the boundary between Spain and Portugal, and falls into the Atlantic after a course of 400 miles, of which only 35 miles are navigable.

**Guadix**, a town of Southern Spain, Andalusia, in the province of Granada. There are iron- and copper-mines in the vicinity. Pop. 13,820.

**Guaduas**, a town, Republic of Colombia, remarkable as being one of the most elevated places on the globe, being 3800 feet above the sea-level. Pop. 9000.

**Guaiacum**, a genus of plants belonging to the nat. ord. Zygophyllaceæ, natives of the West Indies and tropical America. The wood, known as *lignum-vitæ*, is much used in furniture-making and in medicine.

**Guam**, the largest of the Ladrões Islands in the Pacific Ocean. It formerly belonged to Spain, but was ceded to the U.S.A. in 1898 and was turned into a naval base. The area of the island is 225 sq. miles, and the population 15,413 (chiefly Chamorros). Guam is wooded, well-watered, and healthy, and exports copra, maize, fruit, and timber. Agaña is the capital, and the chief port is Apra, which has a magnificent but entirely undeveloped natural harbour. The harbours of Guam are closed to all foreign ships. See *Ladrões*.

**Guan**, a gallinaceous bird of the family Cracidae or Curassows, genera Penelope, Penelopina, Ortalis, Pipile, Aburria, and Chamaepetes, found in Central and South America. The name Guan is more particularly applied to the *Penelope cristata*, the largest bird of the genus, measuring about 30 inches.

**Guanacaste**, a province of the Republic of Costa Rica. Pop. 47,305.

**Guanaco**, or **Huanaco** (*Llama huanacos*), a South American ruminant, of which the domesticated races are the llama and alpaca. It is about 4 feet high, and is extremely swift and sure-footed.

**Guanajuato**, a city of Mexico, capital of the state of the same name, situated on the edge of a narrow plain hemmed in by mountains. It has manufactures of cotton and woollen goods. Pop. 19,408.—The state is situated in the centre of Mexico; area, 10,950 sq. miles; pop. 860,864. Its mines, once the richest in the world, still yield a large amount of gold and silver.

**Guanches**, the aborigines of the Canary Islands, long ago extinct as a separate nation. Their culture reveals unmistakable evidence of Egyptian and Mediterranean inspiration.

**Guano**, a valuable manure, consisting of the partially decomposed and dry excrement of fish-eating sea-birds, which has in some places accumulated in great masses. Great accumulations of guano exist principally in hot and dry tropical regions. The most important of all were the deposits on the Chincha Islands off the coast of Peru, which yielded a considerable revenue to the country, but are now quite exhausted. Peru, however, remains the chief source of supply. Guano may be roughly divided into nitrogenous and phosphatic. The first of these contains about 21 per cent of ammonia. The Peru guano is nitrogenous. Guano is used raw or in its natural state, but most of the phosphatic guanos require to be dissolved by sulphuric acid before using. There are very rich deposits of phosphatic guano on Christmas Island.

**Guantanamo**, a town of Cuba, in the south-east of the island, 12 miles from the port of Caimanera. Pop. (1928), 13,464.

**Guapore**, or **Itenez**, a river of South America, which rises in the Brazilian province of Matto Grosso, and, after a varied course of about 500 miles, unites with the Mamore in forming the Madeira.

**Guarana Bread**, the seeds of the *Paullinia sorbilla*, order Sapindaceæ, a South American tree, pounded and made into cakes. It is extensively used in South America as a stimulant and restorative, and as a material for making a refreshing beverage. The active principle of guarana is said to be identical with theine or caffeine.

**Guarantee**, in law, an undertaking by which a person binds himself to answer for the failure of another. In England no person is liable on any special promise to answer for the debt, default, or mis-carriage of another person, unless a written agreement, or some memorandum in writing for such purpose, shall be signed by the promiser or some other party lawfully authorized by him. It is a general rule that the surety shall not be bound beyond the express words of the engagement.

**Guarda**, a district of Portugal, province of Beira, situated south of the River

Douro. It is very productive. Area, 2116 sq. miles; pop. 256,243.

**Guardafui**, Cape, the most easterly part of the continent of Africa. It is in Italian Somaliland, and lies at the entrance to the Gulf of Aden.

**Guardian**, in law, the custodian of persons incapable of directing themselves, and especially of infants, that is, persons under twenty-one years of age. An Act passed in 1885 provides that, if the father dies without appointing a guardian, the mother becomes sole guardian, and even if a guardian has been appointed the mother is entitled to become a guardian conjointly.

**Guards, Brigade of**, consists of the five regiments of foot guards. These are, in order of precedence, the Grenadier Guards of three battalions, the Coldstream Guards of three, the Scots Guards of two, and the Irish and Welsh Guards of one battalion each. The Grenadier Guards date their official origin to 23rd Nov., 1660, when Charles II, on his return to England at the Restoration, issued a commission to Colonel John Russell to raise a regiment of foot guards under the name of the King's Regiment of Foot Guards. The Coldstream Guards trace their official connexion with the royal army of England to 14th Feb., 1661, when the men of General Monck's regiment (raised in 1649), who were then stationed at Coldstream, laid down their arms as republican soldiers and took them up again as soldiers of the king. The Scots Guards were first raised in Scotland by Charles I in 1642 as Argyle's Regiment, becoming under Charles II the regiment of Scottish Foot Guards (on the Scottish establishment). In 1686 the regiment was brought on to the English establishment. The Irish Guards were formed in 1900 to commemorate the bravery of Irish regiments in the South African War. The Welsh Guards were raised by royal warrant on 26th Feb., 1915.

**Guarico**, a state of Venezuela; area, 25,500 sq. miles; pop. (1926), 125,282. The capital is Calabozo.

**Guarini**, Giovanni Battista (1537-1612), Italian poet. After having studied at Ferrara, Pisa, and Padua, and lectured in his native city on Aristotle, in 1567 he entered the service of Duke Alphonso II of Ferrara, who sent him on various important missions. He is chiefly remembered for his pastoral drama *Il Pastor Fido*

(The Faithful Shepherd), which was an imitation of Tasso's *Aminta*, and which was in its turn imitated by Fletcher (*The Faithful Shepherdess*), and by Jonson (*The Sad Shepherd*).

Guarnieri, the name of an Italian family belonging to Cremona, distinguished for its skill in violin-making. The most celebrated of the family was Giuseppe, whose best instruments belong to the years 1710-1745.

Guastalla, a town of North Italy, near the Po. Pop. 11,880.

Guatemala, a Central American republic bounded by Mexico, British Honduras, the Atlantic, Honduras, Salvador, and the Pacific. The area is 48,290 sq. miles, two-thirds of which are mountainous, while the remainder, the northern and coastal regions, is low, tropical, and fertile. There are several active volcanoes, but the two highest peaks, Fuego (12,075 feet) and Agua, are extinct. Guatemala is well watered by numerous small streams, and has several large lakes including Izabal, Peten, Atitlan, and Amatitlan. The capital is Guatemala City, Quezaltenango; Coban, and Zacapa are important places, and the chief ports are San José, Champerico, and Concepcion del Mar on the Pacific, and Puerto Barrios and Livingston on the Atlantic. The principal products are coffee (annual yield 160,000,000 lb.), sugar (annual yield 42,000,000 lb. white, 100,000,000 lb. brown), bananas, maize, rice, and a little cotton. Forests which cover 1,300,000 acres are not exploited, except in the Peten region which yields mahogany, cedar, and chicle gum (a Guatemalan monopoly). There are a few gold, silver, and lead-mines, and oil resources undoubtedly exist but transport difficulties have, as in everything else, retarded development. On the high plateaux there are important cattle grounds. Guatemala is the chief commercial country of Central America; in 1928 the value of exports was £5,642,314, and of imports £6,022,176. The main exports were coffee, bananas, sugar, and chicle. Exports to and imports from Britain were valued at £56,584 and £457,508 respectively. The population of Guatemala is 2,119,165, of which 60 per cent are Indian, the remainder being mostly of mixed Spanish and Indian descent. Spanish is the language of commerce. The prevalent religion is Roman Catholicism, and educa-

tion is free and obligatory. There is a university at Guatemala City (opened 1918). Military service is compulsory. The railways of Guatemala and of Salvador belong to one company, which controls 652 miles of track, 612 of which are in Guatemala. There are few good roads, and the lack of transport facilities is a severe handicap to development. The unit of currency is the paper peso, valued about 3d. The metric system has been adopted, but certain old Spanish weights and measures are still in use. Guatemala revolted from Spanish rule and joined the Central American Confederation in 1821. In 1847 it became an independent republic. By the Constitution of 1879, which was modified several times, the legislative power is vested in a National Assembly and a Council of State, while the executive authority is vested in the President. Cf. A. H. Keane, *Central and South America* (Stanford's Compendium).

Guava, the popular name for plants of the tropical genus *Psidium* of the nat. ord. Myrtaceæ. *P. Guaiava* (the guava tree) is a small tree, the fruit of which is made into jelly.

Guayaquil, a seaport in Ecuador, on the Guayaquil, some 40 miles above its mouth in the Gulf of Guayaquil, the port of Quito. There are shipyards and manufactures of soap, tobacco, alcohol, &c. It has a cathedral and a university. It is the chief port of Ecuador, and one of the best on the west coast of South America, having accommodation for vessels drawing 26½ feet. Its principal exports are cacao, coffee, ivory-nuts, canes, and rubber. Pop. estimated at 100,000.

Gubbio, a town in Italy, in the province of Umbria. It has manufactures of silk and woollen stuffs. Pop. 27,400.

Guben, a town in Prussia, province of Brandenburg. Brewing, dyeing, and tanning are carried on, and there are manufactures of woollen and linen cloth, and tobacco. Pop. 38,593.

Gudgeon (*Gobio fluviatilis*), a fish, belonging to the carp family (Cyprinidæ), found in the quieter streams in Europe and Siberia.

Guelder Rose, often called Snowball Tree, a cultivated variety of the *Viburnum Opulus*, or water elder, of the order Caprifoliaceæ. Its fruit is red.

Guelders, a province of the Netherlands; area, 1939 sq. miles; pop. 752,892.



**Guefs** (or **Guelphs**) and **Ghibellines**, the names of two great Italian political parties in the thirteenth and fourteenth centuries. The names are derived from the Italian *Guelfi* and *Ghibellini*, which are corrupted from the German *Welfen* and *Waiblingen*. These latter words came to be used as party designations in Germany in the war between Henry the Proud and Conrad of Hohenstaufen, to whom belonged the estate of Waiblingen in Württemberg. About the year 1200 the designations *Guelph* and *Ghibelline* came to be employed to denote respectively the Italian patriotic and Papal party, and the party which supported the domination of the German emperors in Italy. After the fall of the Hohenstaufen the Ghibellines became the partisans of aristocracy, and the Guefs the partisans of democracy and liberty.

**Guelph**, a city of Canada, province of Ontario, in a rich farming district, with manufactures of machinery, agricultural implements, and pianos. It is the seat of the Ontario Agricultural College, and is served by the C.P.R. and the C.N.R. It was founded by John Galt. Pop. 18,469.

**Guenevere**, or **Guinevere**, daughter of King Leodograunce of Camelyard, and wife of King Arthur. She is a famous figure in the Arthurian romances, is supposed to have been the most beautiful of women, "surpassing in beauty all the women of the island", and to have fallen in love with Lancelot of the Lake, one of the Knights of the Round Table.

**Guerara**, a district in the Sahara, lying immediately south of Algeria proper. It forms a chain of oases, and belongs to France.

**Guernsey**, the second largest and most westerly of the Channel Islands; area (with Herm and Jethou), 16,018 acres. The northern part is level, the southern more elevated. The climate is extremely healthy, and the soil is fertile. Cattle-breeding, dairy-farming, horticulture, and floriculture are the chief occupations. Fruit of all kinds, especially grapes, is abundant, and great quantities of early vegetables and tomatoes are sent to the London market. The principal exports are cattle, fruits, vegetables, and granite for paving. The dialect of the island is the pure Norman of some centuries ago; but a knowledge of English is general. The principal place of education is Elizabeth

College, at St. Peter Port, the capital. The island is under a Lieutenant-Governor, who represents the sovereign in the Assembly of the States, a kind of local parliament. It is strongly fortified, and has a militia. Within the bailiwick of Guernsey are included Alderney, Sark, and the islets of Herm, Jethou, Brechou, and Lihou. Total pop. (1931), 42,606.

**Guernsey Lily** (*Nerine Sarniensis*), a beautiful plant, with purple-red flowers, native of South Africa, family Amaryllidaceae.

**Guerrero**, a state of Mexico; area, 25,279 sq. miles. Its surface is diversified by mountain and valley, and partly covered by native forests; and it is rich in minerals, including gold, silver, copper, and iron. The principal port is Acapulco. Pop. (1921), 566,836.

**Gueux**, a name given in derision to the allied nobles and other malecontents in the Netherlands who resisted the despotism of Philip II in 1566. A branch of the Gueux, 'the beggars of the sea', under the leadership of Count de la Marek, captured Brill in 1572, and initiated the great struggle for independence which resulted in the freedom of the Netherlands in 1648.

**Guiana, British**, a British colony in the north of South America, bounded by the Atlantic, Brazil, Dutch Guiana, and Venezuela. It has an area of 90,000 sq. miles, a coast line of 270 miles, and is divided into three settlements—Berbice, Demerara, and Essequibo. The coast tract forms a dreary alluvial belt, 10 to 40 miles broad, beyond which is a range of low hills. The interior is traversed by chains of hills or mountains. On the western boundary is the singular flat-topped mountain Roraima (8600 feet), while other ranges are the Sierra Imataca, the Canucu, and the Sierra Acarai. They are densely wooded, but do not reach a greater elevation than 4000 feet. Gold occurs in various places, most of it being alluvial, and the production 1884-1928 has been valued at £9,755,541. Diamonds worth almost £500,000 are found every year. There are also deposits of manganese ore and mica, and huge deposits of bauxite and kaolin. The chief rivers are the Essequibo, Demerara, Berbice, and Corentyn. The climate though hot is not unhealthy, and there are two wet seasons, December-February and June-August. Of the total area only 275 sq. miles along the coast

and on the river banks are under cultivation. Sugar-cane is the chief crop, and the sugar industry employs fully one-half of the working population. In 1928 the output was 116,484 tons from 54,000 acres. About 50,000 acres are under rice, and coco-nuts are grown in some 26,000 acres. Other products are coffee, cacao, rubber, and limes. The forest area in British Guiana exceeds 78,000 sq. miles, and the country is the only recognized source of greenheart. Other valuable hardwoods are wallaba and mora. The capital and chief seaport is Georgetown on the Demerara River, and New Amsterdam on the Berbice River is a fairly important place. In 1928 the value of exports was £3,271,103 and of imports £2,632,511. The chief exports were balata, drugs, bauxite, sugar, diamonds, rice, timber, and rum. Exports to and imports from the United Kingdom were valued at £952,156 and £1,360,738 respectively. The population is 301,204, including 134,670 East Indians, 118,398 blacks, and 7014 aborigines. Education is well provided for. There are in British Guiana 97 miles of railway track, 450 miles of river navigation, and 450 miles of good roads. The legislative authority is vested in the Governor, a Court of Policy, and a Combined Court, the last of which alone can levy taxes. The executive functions are exercised by the Governor and an Executive Council. Guiana was first settled by the Dutch in 1616 and 1621. After having been captured and restored by the British on several occasions, it was finally ceded to Britain in 1814.—BIBLIOGRAPHY: J. M. Reid, *Commercial Handbook of British Guiana*; G. D. Bayley, *Handbook of British Guiana*.

**Guiana, Dutch, or Surinam**, a Dutch colony in South America, situated between British and French Guiana; area, 54,291 sq. miles. It is flat and swampy on the coast, and mountainous in the interior, and is watered by numerous streams of which the Surinam is the chief. It has a warm, moist climate, and is very fertile, though only a small part is under cultivation. On the Surinam River, about 10 miles from its mouth, is situated the capital, Paramaribo. The principal exports are sugar, coffee, cocoa, molasses, and rum. The government is vested in the Governor-General and Council. Dutch Guiana has been several times in English hands, and

its possession by the Netherlands was not confirmed till 1815. Pop. 128,822.

**Guiana, French**, a French colony in South America, between Dutch Guiana and Brazil; area about 32,000 sq. miles. This territory resembles British Guiana in its physical features, climate, and vegetable productions, with the addition, among the last-named, of pepper, cloves, cinnamon, and nutmeg. The colony includes the Island of Cayenne, celebrated for the pepper bearing that name. Gold has also been found in considerable quantities, and phosphates are now worked. There are dense and valuable forests. The French are said to have settled in Guiana in 1604. Pop. 44,202. There is in addition a penal settlement with a population of 3633.

**Guido Aretino**, or **Guido d' Arezzo** (eleventh century), Italian musician. He invented the musical staff of lines and spaces, and introduced the name of the first six notes of the scale, *ut, re, mi, fa, sol, la*. He has explained his musical doctrines in his works *Micrologus* and *Argumentum Novi Cantus Inveniendi*.

**Guido Reni** (1575 – 1642), Italian painter. Among his best-known works may be mentioned *Aurora*, *S. Mary Magdalene*, *Michael vanquishing Satan*, *Lot and his Daughters*, *Fortune*, and *Ecce Homo*.

**Guild**, a society or association for carrying on commerce, a handicraft, or some other undertaking. Traces of these trade societies are found in the tenth century. In Milan we find the mechanics united under the name *credentia*. At Florence the trades were federated into twenty-one guilds or *arti*. These originated in 1282, on the overthrow of the nobility, and every candidate for citizenship was obliged to enter some particular guild. Such a step became a necessity at a period in which individual rights, as such, failed to secure respect. In the thirteenth century the German guilds of craftsmen obtained the right of defending by arms their own interests, and became so powerful that persons unconnected with a trade were often glad to attach themselves to them. Attempts were made to abolish them, but it was not until the last century that unrestricted freedom to practise any trade was established in the German states. In Britain the main influence of trade guilds was political, as the right of voting

was involved in the membership of a guild. The only restriction on the exercise of trades in England was the statute of Elizabeth, and later this was held to apply only to such trades as were in being at the time of the passing of that statute. By an Act of 1835 all restrictions were removed. The guilds or companies of the City of London (among the oldest of which are the weavers, founded in 1164; the parish clerks, in 1232; the saddlers, in 1280; the fishmongers, in 1284) are still very important and wealthy corporations. From the time of Henry II religious guilds were required to have a charter from the Crown. The property of the religious guilds was sequestered in the reign of Henry VIII. In France guilds were abolished after the Revolution. This was done also at a later period in Belgium, Holland, Italy, Sweden, and Denmark.—Cf. F. Armitage, *The Old Guilds of England*.

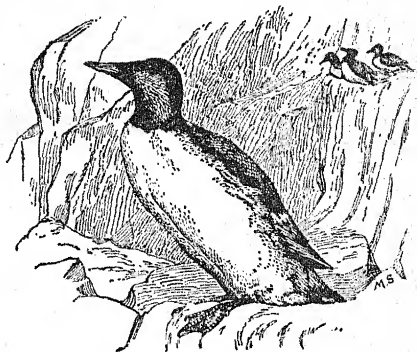
**Guildford**, a borough of England, county town of Surrey, on the Wey. It has an iron-foundry, corn-, paper-, and powder-mills, and an important grain market. Pop. (1931), 30,753.

**Guild Socialism**, a theory for a fundamental reconstruction of society, based on communal ownership of the means of production, distribution, and exchange, the functions of administration and direction being vested in trade unions, which are to comprehend the whole of the workers in the industry concerned. The intellectual origin of the movement was a strong reaction against state socialism, accompanied by dissatisfaction with crude syndicalism. Accordingly, it is proposed that society shall be organized on a dual basis, the present state in a modified and limited form continuing as the representative of the interests of the inhabitants as 'consumers', while the parallel industrial organization of guilds, centralized in a 'Guilds' Congress', assumes responsibility for their interests as 'producers'. The point at which the theory is incomplete is the relation between these two authorities. The movement is an attempt to extend the same democratic control to industrial life as already exists in political life. A serious attempt is now being made to apply its principles in the building industry, in which a number of 'Building Guilds' have been formed in different localities, and have succeeded in building

houses economically and efficiently.—**BIBLIOGRAPHY:** Niles Carpenter, *Guild Socialism*; G. D. H. Cole, *Guild Socialism Re-stated*.

**Guilford**, Frederick, second earl of. See *North, Frederick, Lord*.

**Guillemot**, a name of several web-footed birds belonging to the family Alcidae



Guillemot (*Uria troile*)

or auks, with straight, compressed, pointed bills. Their wings and legs are short. They live on fish, and nest on rocky coasts. The common British guillemot (*Uria troile*) is almost 18 inches long and lays one egg; the black guillemot (*Cepphus grylle*) is smaller, and lays two or three eggs.

**Guillotine**, an engine for beheading persons at one stroke—an invention of the Middle Ages—adopted with improvements by the National Assembly of France during the first Revolution on the proposal of a Dr. Guillotine, after whom it is named. It was first used in Paris, at the Place de Grève, on 25th April, 1792. The same name is given to a machine which cuts by a knife descending between grooved posts, much used for cutting paper or straw.

**Guimaraens**, a town in Portugal, province of Minho, strongly fortified and well built. Pop. 8860.

**Guinea**, a geographical division of Western Africa, including the Atlantic coast-line and an indefinite area of the interior between the frontiers of Senegambia and the southern boundary of Angola. It is divided into two districts, lying north and south of Cape Lopez: the former, called Upper Guinea, includes Sierra Leone, Liberia, the Grain, Ivory,

Gold, and Slave coasts, and parts of Nigeria; the latter, called Lower Guinea, includes part of French Congo and Angola.

**Guinea, French**, a French colony in West Africa, lying between Portuguese Guinea and Sierra Leone. The area is 95,218 sq. miles and the population 1,875,996, including 1357 Europeans. The principal products are palm-oil and -nuts, rubber, rice, gum, earth-nuts, and gold. The capital (Konakry) is connected by a railway 366 miles long with Kourassa on the Niger. This line has been extended about 50 miles to Kankan. See *French West Africa*.

**Guinea, Gulf of**, that portion of the Atlantic which washes the shores of Upper Guinea, between Cape Palmas and Cape Lopez. It includes the bights of Benin and Biafra. The islands of Fernando Po, Principe, and São Thomé are within this gulf.

**Guinea, Portuguese**, a Portuguese West African colony, on the coast of Senegambia. It is surrounded on the land side by French territory. It includes the Bissagos Archipelago, with the Island of Bolama on which the capital of the same name is situated. The chief exports are rubber, wax, oil, seeds, and ivory. Area, 13,940 sq. miles; pop. 289,000.

**Guinea, Spanish**, a Spanish West African Colony consisting of Rio Muni, situated south of the Cameroons, and the Islands of Fernando Po, Annobon, Little Elobey, Great Elobey, and Corisco. The total area of the colony is 10,265 sq. miles, and the population 150,000. The administrative centre of the colony is Santa Isabel on the Island of Fernando Po. See separate articles.

**Guinea-fowl**, or *Pintado*, a genus of gallinaceous birds, family Phasianidæ or pheasants, originally all natives of Africa. The best known are the common domestic guinea-fowl (*Numida meleagris*), the *Numida vulturina* of Zanzibar, the red-crowned *Numida mitrata* of Madagascar, and the *Numida cristata* of West Africa.

**Guinea Pepper** (*Xylopiæ aromatica*), a tree of the same family as the custard apple, the fruit of which is known as 'Negro Pepper'. The name is also given to *Grains of Paradise* and *Capsicum frutescens*.

**Guinea-pig**, a rodent mammal belonging to the Cavy family, native of South America. It is a timid little animal, extremely prolific, and most unintelligent.

**Guinea-worm** (*Filaria medinenensis*), a parasitic white worm of the order Nematoda, varying in length from 6 inches to several feet. It is frequently found in the tissue of the human body below the skin, and produces a painful ulcer.

**Guingamp**, a town in France, department of Côtes-du-Nord, on the Trieux, with manufactures of linen, thread, &c., and several tanneries. Pop. 9385.

**Guinobatan**, a town of Luzon, Philippine Islands, with a trade in hemp. Pop. 20,000.

**Guipuzcoa**, one of the three Basque provinces, in the north-east of Spain, bounded north by the Bay of Biscay, north-east by France; area, 728 sq. miles. The coast is bold and rocky, and much indented; the interior is generally mountainous. The chief riches of the province are in its minerals, particularly iron, and its woods, which are used in smelting it. San Sebastian is the capital. Pop. 262,187.

**Guisborough**, a town in England, in the county of York (N. Riding). Cast-steel founding is carried on. Pop. (1931), 6306.

**Guiscard**, Robert (that is, *Robert the Cunning*) (1015-1085), Duke of Apulia and Calabria, a son of Tancred de Hauteville. On the death of his brother Humphrey he was proclaimed Count of Apulia in 1057. He then conquered Calabria, and sent his youngest brother, Roger, to seize Sicily. Robert himself arrived in Sicily in 1061, and, in conjunction with his brother, defeated the Saracens at Enna. He took up arms for Michael VII, the deposed Byzantine emperor, and defeated Alexis Comnenus at Durazzo (1082). As Gregory VII had been meanwhile imprisoned by the invading forces of Henry IV of Germany, Guiscard delivered the Pontiff in 1084. He then went again to Epirus, where he made himself master of many of the islands of the Archipelago. He was upon the point of advancing against Constantinople, when he died.

**Guise**, a distinguished ducal family of France, a branch of the House of Lorraine. The founder was Claude, a son of René II, Duke of Lorraine, who in 1506 became naturalized in France. In his favour the county of Guise was erected in 1528 by Francis I into a duchy. He died in 1550, leaving behind him five daughters (the eldest of whom, Marie, married James V of Scotland, and was the mother of Mary, Queen of Scots) and six sons—François,



who succeeded him, Charles (Cardinal of Lorraine), Louis (Cardinal of Guise), Claude, François, and René. The family acquired great political importance on the accession of Francis II, who was married to Mary, Queen of Scots. The direct line became extinct in 1675.—Two of the dukes require particular mention.—*François de Lorraine* (1519–1563), the second duke. Under Henry II and Francis II he was the virtual ruler of France. On the death of Francis II the factions of Condé and Guise arose. When civil war broke out, the Duke of Guise took Rouen and Bourges, and won the battle of Dreux in 1562.—*Henry* (1550–1588), third duke, eldest son of the preceding. He was a bitter opponent of the Huguenots, and fought against them at Jarnac and Moncontour, and advised the massacre of St. Bartholomew (1572). Having brought about a rising of the Catholics in Paris (May, 1588), he entered the city in triumph, but was assassinated a few months later in the king's cabinet at Blois.

**Guise**, a town of France, department of Aisne, on the left bank of the Oise. It has manufactures of textiles, iron- and copper-foundries, &c., and a large work for making stoves, connected with which is an edifice in which live some 400 families of workers. Pop. 8000.

**Guitar**, a stringed instrument with a hollow body, and a neck somewhat similar to that of a violin, used especially to accompany the voice. It is extremely popular in Spain. The Spaniards derived it from the Moors, who brought it from the East.

**Guizot**, François - Pierre - Guillaume (1787–1874), French historian and statesman. On the fall of the empire he obtained several public offices, such as Councillor of State, and director-general of the departmental and communal administration. In 1816 he published *Du Gouvernement représentatif et de l'état actuel de la France*, and *Essai sur l'instruction publique*. After the death of Périer, Guizot, along with Thiers and de Broglie, formed a coalition ministry, and he rendered great service as Minister of Public Instruction. He became Ambassador at the British court in 1840, and next year he became the real head of the Government of which Soult was the nominal chief. He retained the office of Minister of Foreign Affairs until 1848. After the fall of Louis Philippe,

Guizot escaped and fled to England. Henceforth he practically retired from public life. Among his numerous works may be mentioned: *Histoire de la civilisation en France*, *Histoire générale de la civilisation en Europe*, *Mémoires pour servir à l'histoire de mon temps*, and *Mélanges biographiques et littéraires*.

**Gujarat**, the northern division of Bombay Presidency, British India; area, 12,579 sq. miles; pop. 3,718,000. In a wider sense it is taken to include the Kathiawar Peninsula (between the Gulfs of Cutch and Cambay), the territory of the Gaekwar of Baroda, and several smaller states. Total area, 70,000 sq. miles; pop. 11,000,000. There is a great plain in the centre, and the whole division is extremely fertile, producing cotton, maize, barley, wheat, and opium. *Gujarati* is one of the seven main Aryan vernacular languages of India. The town of Gujarat is noted for its furniture manufactories. Pop. 19,000.

**Gujranwala**, a town of India, in the Punjab, administrative head-quarters of the district of the same name. It manufactures brass-ware and cottons. Pop. 29,470.—Area of district, 4082 sq. miles. Pop. 923,420. Two-thirds are under cultivation, and wheat, maize, cotton, and barley are produced.

**Gulbarga**, a division, district, and town of India, in Hyderabad. The division has an area of 22,110 sq. miles and a population of 3,673,100, while the district has an area of 6719 sq. miles and a population of 1,150,983. Millet and cotton are the chief crops. Gulbarga town is a busy trade centre. Pop. 34,000.

**Gulfport**, a port of the U.S.A., situated near the mouth of the Mississippi on the north side. It is under the exclusive control of the United States Government, and is a port of entry. The harbour, which is well protected by Ship Island and Cat Island, has a depth of 24 feet. It has good accommodation, and is being rapidly improved. The exports are lumber and cotton. Pop. 10,000.

**Gulf Stream**, one of the most celebrated of the oceanic currents, so called because it issues from the Gulf of Mexico. It owes its origin to the fact that the westward-moving waters of the tropical portion of the Atlantic, encountering the eastward projection of South America, become divided into two currents, one setting

southwards along the Brazilian coast, and the other northward, past the mouths of the Amazon and Orinoco, into the Caribbean Sea. It then enters the Gulf of Mexico, and emerges through the Channel of Florida as the Gulf Stream. Its course is next to the north and eastwards, in a direction parallel to the coast of the United States, past Cape Hatteras, along the southern edge of the 'great banks' of Nantucket and Newfoundland, after which its course as a distinct current cannot be traced. In the earlier part of its course, especially when rounding the extremity of Florida, the Gulf Stream forms a well-defined current, distinguished by its high temperature and its deep blue or indigo colour. On account of the descent of the Polar or Baffin Bay current along the coast in a direction opposite to that of the Gulf Stream, the water on its inland side is colder than that to the eastward of it. The relatively high temperature of Western and North-Western Europe must rather be referred to the general set of the tropical waters to the north-east, and to the warm winds blowing in the same direction, than to the Gulf Stream exclusively.

**Gull**, the general name of a sub-family (Larinae) of birds, distinguished by their straight bill bent at the point, and by their large wings, slender legs, palmated feet, and small hind toe. The larger species frequent the sea coasts. The smaller ones come inland. They are good swimmers and fliers, and are usually seen in flocks. They will eat animal food in any condition, but their main diet is fish, and they are extremely greedy. They breed only once a year, laying two to four eggs. Among the principal are the common gull (*Larus canus*), the lesser black-backed gull (*L. fuscus*), the black-headed gull (*L. ridibundus*), the Iceland gull (*L. leucopterus*), the herring gull, the great black-backed gull, the little gull, the kittiwake, and the ivory gull.

**Gum**, a substance which exudes, or may be drawn, from the bark of certain trees, such as the plum or the peach. Some gums, such as gum-arabic, dissolve in water; others, like tragacanth, are only partially soluble; they are insoluble in alcohol, and are thus distinguished from resins. They have no odour, and only a very faint taste. *Gum-resins* require water and alcohol to dissolve them.

**Gum-arabic** is the purest form of gum, and may be regarded as typical. It comes from various species of *Acacia*. The gum exudes spontaneously. Gum-arabic is very largely employed in the finishing and dressing of fabrics; for thickening the colours in calico-printing; in pharmacy; as a cement; in ink-making; for making crayons and water-colour cakes, and for many other purposes.

**Gumbinnen**, a Prussian town, province of East Prussia, on the Pissa. It has brewing and distilling industries, and manufactures woollen and linen cloth. Pop. 14,540.

**Gum-resins**. See *Resins*.

**Gumti**, a river of India, in the United Provinces, flowing south-east and falling into the Ganges between Ghazipur and Benares. Length about 500 miles.

**Gümüljina**, town of Greece, in Thrace. It has a large annual cattle market, and is situated in a good wine-producing district. Pop. 21,294.

**Gun**, a fire-arm from which projectiles are discharged by means of an explosion of gunpowder controlled by the firer. (See also *Cannon* for the use of the word in that connexion; and *Machine-gun*; *Pistol*.) The earliest form of portable firearm was merely a plain metal tube attached to a straight piece of wood; the charge was ignited by the simple method of putting a match or taper to the powder by way of the touch-hole. A slightly improved adaptation of this kind of gun was known as the 'match-lock', and remained in general use till the seventeenth century. A device known as the 'wheel lock', where a rotating wheel was supposed to produce a spark, was unsuccessful, and the match-lock was only superseded when the flint-lock was introduced. In this gun the cock was provided with screw jaws into which a prepared flint was fitted. The cock or hammer was then released by a trigger-operated spring, and, falling with considerable force on the steel priming pan, ignited the powder therein, and so the charge. For sporting purposes the flint-lock in its turn gave place to the percussion gun, in which the barrel was fitted with a small hollow nipple on which was placed a cap containing a fulminating material which, on being struck by the hammer, exploded the charge in the barrel. All these guns were, of course, muzzle-loaders. About the middle of the nineteenth century, assisted by the invention

of the fulminating material referred to above, breech-loaders were beginning to come into use. The first guns of this kind were known as pin-fire guns; that is to say, the cartridge containing the charge was provided with a pin which, when struck by the hammer, exploded the charge. This system was later improved by placing in the false breech on the stock a firing-pin which was so arranged as to strike a cap in the centre of the cartridge base when operated on by the hammer. This form was known as the central-fire gun. In modern guns the hammer has disappeared entirely, and all the firing mechanism is contained inside the false breech, only the triggers appearing outside. All such guns are fitted with a safety device by which the firing mechanism can be put out of gear till required. See *Rifle*.—BIBLIOGRAPHY: T. F. Fremantle, *Book of the Rifle*; Lord Walsingham and Sir R. Payne-Gallwey, Bart., *Shooting* (Badminton Library).

**Gun-cotton.** See *Explosives*.

**Gun-licence.** No person may use or carry a gun (including rifles, pistols, and air-guns) without an excise licence, which must be produced on demand. The following are exempt from this law: (1) persons in the army, navy, territorials, or police when on duty; (2) gunsmiths; (3) common carriers; (4) persons holding game licences (see *Game Laws*); (5) occupiers of lands using a gun to scare birds or vermin; (6) persons carrying the gun of a licence-holder. A licence is not necessary for a gun used or carried in the owner's house or curtilage. The penalty for breach of the Act is a fine of £10. Gun-licences in the United Kingdom expire on 31st July; they cost 10s. a year. It is important to see also *Fire-arms Act, 1920*.

**Gun-metal.** See *Alloy*.

**Gunnedah**, a town of New South Wales, Australia, on the Namoi River, 161 miles from Newcastle. There is good coal in the vicinity. Pop. 4100.

**Gunnel**, or **Butterfish** (*Pholis gunnellus*), a small shore-fish like the blennies, belonging to the family Pholididae. It is brown with black spots, and is about 6 inches long. The female protects her eggs, sometimes assisted by the male.

**Gunnera**, a genus of plants, order Haloragidaceae, one species of which (*G. scabra*), a native of South America, is used as an ornamental plant.

**Gunnery** is the science of directing an artillery projectile so that it will strike a given target. The path taken by a projectile in its flight through the air to the first point of impact is called the *trajectory*. To allow for the fall of the projectile due to gravity, it is necessary to point the axis of the bore above the mark. This angle of elevation is called the *range*. In addition to the range it is necessary to give a second angle of either elevation or depression, according as the target is above or below the horizontal plane of the gun. This is called the *angle of sight*. When the target is visible from the gun, this angle is automatically put on by aligning the sights on the target. In *indirect laying*, when the target is not visible from the gun, this angle of sight must be calculated and given to the gun by means of a clinometer.

**Gunpowder.** The early history of gunpowder is very obscure. According to some authorities it was known to the Chinese in very early times, while others attribute the invention of it to Roger Bacon or to Berthold Schwartz, a German monk. If Roger Bacon did not invent it, he at any rate was one of the earliest writers to allude to it, which he did in his *De mirabili potestate artis et nature* (1242). It was not manufactured on a large scale until the reign of Elizabeth, when the works at Faversham were opened. See *Explosives*.

**Gunpowder Plot**, a conspiracy formed in England in 1604, the second year of the reign of James I, by some Roman Catholics, to blow up the king and Parliament. The time fixed for the execution of the plot was the 5th of Nov., 1605, when Parliament was to be opened by the king in person. The plot originated with Robert Catesby, Thomas Winter, and John Wright, and was at once made known to Guido Fawkes, a zealous Catholic, who had served in the Spanish army in Flanders, and to Thomas Percy, a relation of the Earl of Northumberland. These five were the original conspirators, but the plot was subsequently communicated to Sir Everard Digby, Ambrose Rookwood, Francis Tresham, Thomas Keyes, Christopher Wright (a brother of John), and to some Jesuit fathers and others. The conspirators hired a cellar right under the chamber of Parliament, and filled it with powder, faggots, and billets. The plot

was discovered by means of a letter sent Lord Montague, a Catholic peer in favour with the court, who laid it before the Secretary of State, Cecil. Catesby, Percy, and the two Wrights were killed in defending Holbeach House, in which they had taken refuge, against the sheriff. Digby was tried and executed at Northampton; Tresham died in prison. Fawkes, Rookwood, Winter, and others were tried at Westminster and executed.

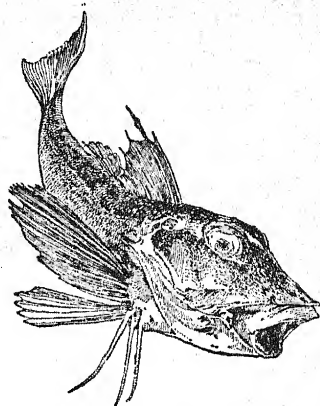
**Gunter**, Edmund (1581–1626), English mathematician and astronomer. He was professor of astronomy in Gresham College, London. He was the first to employ the terms *cosine*, *cotangent*, &c., and invented several measuring instruments, as Gunter's chain, Gunter's scale.

**Guntur**, a town of India, Presidency of Madras, district of Kistna, 30 miles from the Coromandel coast. It trades in cotton. Pop. 25,000.

**Gurkha**. The name by which the inhabitants of Nepal, on the north-east frontier of India, are generally known. The Gurkhas, from whom a large number of recruits for the Indian army are drawn, claim descent from Rajput immigrants from India who found their way into Nepal about the middle of the eighteenth century and established themselves in the district of Gurkha, from which point they overran the country and grafted themselves on the original indigenous inhabitants, a Mongoloid race. By religion they are Hindus or Buddhists, Hinduism being more prevalent, though they are not so particular as to ceremonial observances as are the more orthodox Hindus of India. In build the Gurkha is a stout and sturdy man, seldom over 5 feet 5 inches in height. The national weapon of the Gurkha of all grades of society is the kukri, a short, curved, broad-bladed, and heavy knife about 20 inches long. The Gurkha is an excellent soldier, faithful, fearless, and self-reliant, extremely fond of sport, and eagerly fraternizing with British soldiers. There are 10 Gurkha regiments in the Indian army. They rendered excellent service during the European War.

**Gurnard**, or **Gurnet**, the popular name of spiny-finned fishes belonging to *Trigla* and related genera. The grey (*Trigla gurnardus*) and the red (*T. cuculus*) gurnards are common on British coasts; other familiar species are the sapphirine gurnard

(*T. hirundo*) and the piper (*T. lura*). Flying gurnards (*Dactylopterus*) inhabit



Red Gurnard (*Trigla cuculus*)

the Mediterranean, Atlantic, and Indian seas.

**Gustavus I**, commonly called *Gustavus Vasa* (1496–1560), King of Sweden. He roused the peasants to resist Danish oppression, defeated the Danes, took Upsala and other towns, and in 1523 was elected king. In 1529 he procured the abolition of the Roman Catholic religion in Sweden, and established Protestantism. During his long reign Sweden made great progress in commerce and civilization.

**Gustavus II** (*Gustavus Adolphus*) (1594–1632), King of Sweden. He was trained to war under experienced generals, and was in command of the army in his seventeenth year during the war with Denmark, which was concluded in 1613. He then turned his arms against the Russians, drove them from Ingria, Karelia, and a part of Livonia, which were secured to him by the Peace of Stolbova in 1617. He was then engaged in a war with Poland, which lasted nine years, and was allowed to retain important conquests in East Prussia. He embarked for Germany in 1630 with about 20,000 men, and in a short time had seized nearly all Pomerania. After taking many fortified towns, repeatedly defeating the imperial generals, and conquering a great part of Germany, he was killed in the battle of Lützen, against Wallenstein.—Cf. C. R. L. Fletcher, *Gustavus Adolphus*.



**Gustavus III** (1746-1792), King of Sweden. He succeeded his father, Adolphus Frederick, in 1771. Finding the country weary of the misrule of the nobles, he gained the good-will of the army, surrounded the Assembly of the States-General, and forced them to accept a new Constitution which much restricted their privileges. In 1789 he executed another *coup d'état*, arresting the opposition leaders, and passing a law extending the royal prerogative. He was shot at a masquerade by Ankarstroem, a disbanded officer.

**Gustavus IV** (1778-1837), King of Sweden. He succeeded his father in 1792. He was a fanatical opponent of the French Revolution. In 1808 he quarrelled with England, his only ally. Finland was lost to Sweden, and in 1809 a revolution took place. Gustavus was dethroned, and his uncle, the Duke of Sudermania, proclaimed king under the title of Charles XIII. Gustavus died in poverty at St. Gall.

**Güstrow**, a town of Germany, in Mecklenburg-Schwerin, on the Nebel. There is an annual wool fair, and the industries include the manufacture of sugar, tobacco, motor-cars, and iron goods. Pop. (1925), 19,084.

**Gutenberg**, Johan (c. 1398-1468), German printer, the reputed inventor of printing with movable types. In 1448 he was at Mainz, where he formed, two years after, a copartnership with Johann Fust, and established, mainly with the money of the latter, a press, in which the *Mazarin Bible*, the *Letters of Indulgence*, and the *Appeal against the Turks* were printed. After five years this connexion was dissolved, and, according to some, Gutenberg carried on a separate printing establishment. No books, however, can be attributed to Gutenberg with certainty after the date 1454.

**Gütersloh**, a town of Westphalia, Germany, with textile manufactures and a trade in Westphalian ham. A rye-bread made locally, and known as *pumpernickel*, is famous for its nutritive qualities. Pop. 18,336.

**Guthrie**, Thomas (1803-1873), Scottish divine. In 1843 the Disruption took place, and Guthrie took an active part along with Chalmers and Candlish in organizing the Free Church. The work with which his name is chiefly identified out of Scotland was the introduction into Edinburgh

of the ragged-school system, then recently originated in London and Aberdeen. His *Plea for Ragged Schools* (1847) is his best-known work.

**Gutta-percha**, a substance resembling caoutchouc, obtained from Malacca, Borneo, and other islands of the Indian Archipelago. When pure, gutta-percha is of a brownish-red colour. It is insoluble in water, soluble with difficulty in ether and other caoutchouc solvents, but very readily in oil of turpentine and naphtha. Gutta-percha has been used as a substitute for leather; as an insulating coating for submarine telegraph cables; as an ingredient in mastics and cements; for the manufacture of flexible hose-tubes and bottles.

**Guttiferae**, a natural order of dicotyledonous tropical shrubs secreting an acrid, yellow, resinous juice of some commercial value. The fruit of some species is valuable.

**Guy**, Thomas (1645-1724), English philanthropist. His principal gains arose from dealings in South Sea stock in 1720. He amassed a fortune of nearly half a million sterling, of which he spent upwards of £200,000 in building and endowing Guy's Hospital (q.v.).

**Guyas**, a maritime province of Ecuador, traversed by the River Guyas, which is navigable for light-draught vessels. The chief products are cocoa, coffee, sugar, and tobacco. The capital is Guayaquil. Pop. 150,000.

**Guy of Warwick**, an old English metrical romance, whose hero is said to have slain in single combat the Danish giant Colbrand, the Dun Cow of Dunsmore, and the dragon of Northumberland, and to have performed many other wonderful feats.

**Guyon**, Jeanne-Marie Bouvier de la Motte (1648-1717), French writer. After the death of her husband she began the religious propagandism of her extreme views of self-abnegation, indifference to life and death, and even to future salvation or perdition. She also published numerous works, such as *Le Cantique des Cantiques interprété selon le sens mystique* (1685), *Poésies spirituelles* (5 vols., 1685), and *Discours chrétiens et spirituels* (1716). A commission of ecclesiastics, chief amongst whom was Bossuet, condemned the doctrines of Madame Guyon, which had spread rapidly, in 1695. This led to her

being imprisoned for some years, afterwards in the Bastille, whence she was liberated in 1702. The rest of her life was spent in retirement and in works of charity.—Cf. T. Upham, *Life, Religious Opinions, and Experiences of Mme Guyon*.

Guyot, Yves (1843–1928), French politician and economist. He became known as a champion of industrial freedom, an opponent of protection and socialism, and an authority on financial questions, and was appointed editor of the *Journal des Économistes* in 1909. His works include: *Études de physiologie sociale* (1882), *La Science économique* (1881), *L'impôt sur le revenu* (1887), and *La Tyrannie socialiste* (1893).

Guy's Hospital, a London hospital, founded in 1723 by Thomas Guy (q.v.). The original building, completed in 1725, contained accommodation for 400 sick or incurable persons. The hospital buildings have been greatly improved and enlarged, more especially by means of a bequest in 1829 of £190,000 from William Hunt, at one time a governor, and the hospital is one of the largest in London, with about 600 beds. Attached to the hospital is an extensive medical school, containing lecture-rooms, museums, and a medical library. There are usually about 350 students at the hospital medical school.

Gwalior, a city and fortress of India, capital of the state of Gwalior, situated about 65 miles south of Agra. The fortress, which is the largest, the strongest, and the most magnificent of the native fortresses in India, contains wells and reservoirs of water, and is inaccessible except by steps up the side of the rock. Old Gwalior, the town at the eastern base of the rock, has some remarkable ruins of temples. New Gwalior or Lashkar (the camp), the residence of the ruler, has sprung up on the south-eastern skirt of the rock, and is a flourishing city with a large area and a population of 80,387.—The state of Gwalior, connected with the Central India Agency, has a total area of 25,133 sq. miles. The drainage is chiefly taken by the Chambal, which forms part of the boundary on the north-west and north-east and finally joins the Jumna. The products are grains and pulse of various kinds, oil-seeds, cotton, and in the south-west and south opium. Pop. 3,100,000.

Gwelo, a town in Southern Rhodesia,

90 miles north-east of Bulawayo. It is an important railway junction, and there are important gold-fields in the vicinity. White population, 2926.

Gwynn, Nell (1650–1687), English actress. She was at first an orange girl in Drury Lane Theatre, but took early to the stage, her first performance being in 1665 in *The Indian Emperor* of Dryden. She acted in many parts both in tragedy and comedy, though she was best in comic parts. About 1667 she became the mistress of Lord Buckhurst, who surrendered her about 1670 to the king. From her are sprung the Dukes of St. Albans, but she herself received no title.

Gymnosperms. See *Botany*.

Gympie, a town of Australia, in Queensland, on the side of a range of hills overlooking the River Mary. It owes its origin to the rich gold-reefs here, which are worked to a great depth. Pop. 6519.

Gynœceum, in botany, the pistil taken in a collective sense, precisely as the stamens form the andrœceum, the petals the corolla, and the sepals the calyx.

Gyöngyös, a town, Hungary, 44 miles north-east of Budapest; it has manufactures of woollen stuffs, an active trade, and produces the celebrated Erlauer red wine. Pop. 18,315.

Győr, the Magyar name of the city hitherto known as Raab. It stands at the confluence of the Raab with the Danube. It manufactures machinery and oil. Pop. 50,036.

Gypsies (so called because they were supposed to have come from Epirus, known as Little Egypt), a wandering nation called in France *Bohémien*s, from the belief that they were Hussites driven from Bohemia, in Germany, *Zigeuner*, and in Italy *Zingari*. They call themselves *Romany*, from *rom*, a word applied to the Byzantine Empire and still preserved in the name Romania. The race is slowly melting away, and its total number is about 500,000. The Gypsies are most numerous in the Balkan Peninsula, Romania, and Russia. They are now considered to have come from India, the main body of their language, though mixed with a great number of borrowed words, having a close affinity with some of the Indian languages, and having an Oriental grammar corresponding to that of several Indian dialects. They first appeared in Germany in 1417, and during the fifteenth

century passed through the whole of Europe. The typical Gypsies rarely settle permanently anywhere. Their talent for music is remarkable. In England the Gypsies first appeared about the beginning of the sixteenth century, and notwithstanding severely repressive enactments on the part of the Government continued to maintain themselves as tinkers and mat- and basket-makers. In Scotland they were more favourably received, the town of Yetholm, in Roxburghshire, being once a sort of head-quarters for the race, and almost exclusively inhabited by Gypsies.

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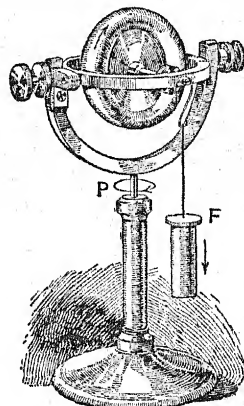
**Gypsophila**, a genus of Caryophyllaceæ, natives chiefly of the Mediterranean region. Several are cultivated for their flowers.

**Gypsum**, a colourless or white monoclinic mineral, chemically a hydrated calcium sulphate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ). Its crystallized varieties have been called *selenite*, and in a massive state it forms the rock *alabaster* (q.v.). At about  $200^\circ \text{C}$ . it gives off three-quarters of its water and becomes plaster of Paris. Gypsum is found in great masses near Paris, in Provence, and near Burgos in Spain, and occurs abundantly as beds in the Triassic strata of Northern Europe. When pulverized by grinding or burning, it has been used with good effect as agricultural manure.

**Gypsy-wort** (*Lycopus europæus*), a labiate plant, found in Britain, yielding a dye.

**Gyro-compass**. This instrument, sometimes called the gyrostatic compass, fulfils the same purpose as the mariner's or magnetic compass, but its principle is totally different. Its action has nothing to do with magnetism, but depends on the dynamical properties of bodies in rapid rotation. The leading navies of the world

are now equipped with gyro-compasses—for use in submerged submarines they are indispensable. The details of the mechanism in such an instrument as the Sperry gyro-compass are very complicated, but the action depends essentially on two



Gyroscope

properties of a rapid rotator, its *directional rigidity* and its tendency to *precess*. The axle of a wheel spinning at great speed, if set to point to the pole star, will continue to point to it no matter how the wheel is moved about. This is directional rigidity. Precession is shown in the *gyroscope* (see fig.). When the weight *r* is hung to the axle of the spinning wheel, the wheel with its horizontal and vertical supporting rings turns round the vertical axis in the direction indicated at *p*, with constant angular speed.

The *Schlick controller* is a gyrostatic device for steadying a ship at sea. Torpedoes are kept in a straight course by the action of a gyrostat.

**Gyula**, a market town of Hungary, on the Körös. There is a trade in wine, oil, flour, and spirits. Pop. 24,284.

## H

**H**, the eighth letter of the English alphabet, often called the *aspirate*, as being a mere aspiration or breathing, though not the only aspirated letter in English. The sound that distinctively

belongs to it is that which it has at the beginning of a syllable before a vowel, as in *hard*, *heavy*. It is very commonly joined to other consonants to represent sounds for which there are no special

letters in the alphabet, as in the digraphs *ch, sh, th.*

**Haakon VII** (1872– ), King of Norway. The second son of King Frederick VIII of Denmark, he was elected in 1905 King of Norway on the separation of this country from Sweden. In 1896 he married Princess Maud, youngest daughter of King Edward VII.

**Haarlem**, a town of Holland, province of North Holland, intersected by the Spaarne, which is joined by canals from Leyden and Amsterdam. Amongst the notable buildings are the church of St. Bavon with its celebrated organ (built in 1735), and the Prinsenhof, in which the Provincial Assembly meets. Haarlem has various industrial works, a celebrated type-foundry, the oldest and most famous printing-office in Holland, and its flower trade, especially in hyacinths and other bulbs, is very important. Haarlem was a prosperous place as far back as the twelfth century. During the revolt of the Netherlands it sustained a famous seven months' siege by the Spaniards. Pop. 80,136.

**Haarlemmermeer**, a commune of Holland between Haarlem and Amsterdam. It consists of the former Lake of Haarlem which was formed by the Y in the fifteenth century and which was drained between 1840 and 1853. Pop. 24,086.

**Habakkuk**, the eighth of the twelve minor prophets. He flourished about 600 B.C. at the time of the invasion of Judah by the Chaldeans, against whom he prophesies God's retributive justice.

**Habeas Corpus** (Lat., 'that you have the body'), one of the most ancient and celebrated writs of English law. This writ, issued by the High Court, is directed to any party unjustly detaining another in custody, and requires that 'the body' of the prisoner be produced and the cause of the detention stated. It is granted at the suit of the prisoner himself or other party. It is the great safeguard of personal liberty, and is as old as Magna Charta, but its constant evasion by weak and servile judges under the Stewart kings led to the strengthening of the law by the passing of the Habeas Corpus Act, 1679.

**Hachi-oji**, a town of Japan, Island of Honshu. It is 25 miles west of Tokyo, and carries on silk-worm rearing and silk-weaving. Pop. 38,955.

**Hackney**, a borough of London, 3 miles N.N.E. of St. Paul's. Pop. (1931), 215,380.

**Haddington**, a royal burgh of Scotland, capital of the county of East Lothian, 17 miles east by north of Edinburgh, on the Tyne. Its grain-market is one of the largest in Scotland, and there are woollen manufactures. Pop. (1931), 4405.

**Haddington**, now **East Lothian**, a county of Scotland bounded by the Firth of Forth, the North Sea, Berwickshire, and Midlothian; area, 280 sq. miles, of which four-fifths is fit for cultivation. The surface rises gently from the coast towards the Lammermuir Hills, which form its south boundary. It is divided into two nearly equal portions by the River Tyne. The minerals include coal, limestone, ironstone, and sandstone; the coal is worked. The low lands of the north and the west are very fertile, while the high lands adjoining the Lammermuir Hills supply excellent pasturage for sheep. Fishing and fish-curing are carried on at Dunbar and other places. Pop. (1931), 47,369.

**Haddock**, a fish of the cod family (*Gadidae*), *Gadus eglefinus*. It has a dark spot on each side of the body just behind the head, and weighs from 2 to 6 lb., though sometimes as much as 10 lb. It is a valuable food fish.

**Haderslev**, a seaport in Slesvig, Denmark, on a fiord of the same name opening to the Little Belt. It can accommodate vessels drawing 20 feet. The exports are cereals, malt, pork, eggs, butter, &c. Pop. 15,000.

**Hades**, originally the Greek name of the lord of the lower or invisible world, afterwards called Pluto; the *Septuagint*, however, uses the word to represent the Hebrew *sheol*, the abode of the dead.

**Hadhramaut**, a district in the extreme south of Arabia, formerly stretching along the coast from Yemen to Oman, with the great desert as its northern limit. The name is now, however, usually applied to a much smaller area in the south-west. Some of the valleys are fertile, and there are numerous villages on the mountain slopes. Dates, indigo, bananas, and grain are cultivated. Makallah, on the coast, is the chief commercial centre. The British exercise a certain amount of political influence over Hadhramaut, especially over the coastal region. The population is estimated at 500,000.

**Hadj**, the Mohammedan pilgrimage to



Mecca, which every Mohammedan ought to perform once in his life, and after which he is entitled to prefix *Hadji* to his name. The pilgrimage has been made in disguise by Burckhardt in 1814, by Burton in 1853, by T. F. Keane in 1878, by Snouck-Hurgronje in 1884, and by A. J. B. Wavell in 1911.

**Hadleigh**, an old market town of England, Suffolk, 10 miles west of Ipswich, formerly one of the chief seats of the woollen manufacture introduced by the Flemings. Pop. (1931), 2952.

**Hadley**, John (1682-1744), English astronomer. He is the reputed inventor of the quadrant that goes by his name, though the honour is also claimed for Newton, from whom Hadley got a description of the instrument in 1727, and for Thomas Godfrey of Philadelphia, who produced his instrument about the same time as Hadley in 1731. The Royal Society decided that Godfrey and Hadley were both entitled to the honour of the invention. Hadley also invented the sextant.

**Hadrian** (Publius Ælius Hadrianus) (76-138), Roman emperor. On the death of Trajan (A.D. 117), he assumed the government as his adopted son. Hadrian's policy was a peaceful one, because he saw that the further extension of the empire only weakened it. Although avoiding war as much as he could, he kept the armies in excellent condition, fortified the frontiers in Germany, and, crossing over into Britain, constructed the wall known as Hadrian's Wall (or that of Severus), which protected the Roman province from the barbarous tribes of the north. In 131 he promulgated the *Edictum Perpetuum*, a fixed code of laws, which forms an important epoch in the development of Roman law.

**Hadrian's Wall**. See *Roman Roads and Walls*.

**Hadrosaurus**, a genus of large extinct reptiles, remains of which have been found in the Upper Cretaceous strata of the United States, and in England. It appears to have resembled the gigantic iguanodon of Europe in its size, herbivorous habits, and anatomical structure.

**Haeckel**, Ernst (1834-1919), German scientist and natural philosopher. He was the most prominent exponent of the Darwinian theories in Germany. Among his works are: *The Radiolaria* (1862), *The History of Creation* (1868), *Anthropology*

(1874), *History of the Evolution of Man* (1875), *Collected Popular Discourses on the Development Theory* (1878-1879), and *The Riddle of the Universe*.

**Hæmatite**, Red and Brown. See *Iron*.

**Hæmatopus**, a genus of plover-like birds, the best-known species of which is *H. ostralegus*, or common oyster-catcher, sea-pie, or mussel-picker.

**Hæmoglobin**. See *Blood*.

**Hafiz** (Mohammed Shems-ed-dîn) (d. A.D. 1388), Persian poet. He preferred independent poverty as a dervish to a life at court, whither he was often invited by Sultan Ahmed, who earnestly pressed him to visit Baghdad. His poems, known collectively as the *Divan*, are Anacreontic in sentiment, abounding in the praise of love and wine. An English translation of the *Divan*, by H. W. Clarke, appeared in 1891.

**Hafnarfjörður**, a village in Iceland. Pop. 2366.

**Hag**, the name of the fish-like vertebrates of the genera *Myxine* and *Bdellostoma* belonging to the class Cyclostomata, which are lower in the scale than fishes. They are of eel-like form, and have no eyes, limbs, or scales; the mouth is formed for suction. *Myxine glutinosa*, the common hag, is found in the British seas, and is about 12 or 15 inches long.

**Hagen**, a manufacturing town of Prussia, in the Westphalian coal-field, at the confluence of the Volme and Ennepe. It has iron- and steel-works, and manufactures of metal goods and textiles. Pop. 92,862.

**Hagenau**, a town of France, Alsace-Lorraine, on the Moder. It has some manufactures, and is a centre of hop culture. Pop. 18,860.

**Hagerstown**, a town of Maryland, U.S.A., with manufactures of carriages, bicycles, furniture, flour, and silk. Pop. 28,064.

**Haggai**, the tenth in order of the minor prophets, and first of those who prophesied after the captivity. The book of Haggai consists of four distinct prophetic addresses intended to bring about the rebuilding of the temple.

**Haggard**, Sir Henry Rider (1856-1925), English novelist. His first book was *Cetawayo and his White Neighbours* (1882), but he became much better known by his *King Solomon's Mines* (1886), and still

more by his romantic *She* (1887), which have been followed by *Allan Quatermain*; *Jess*; *Maiva's Revenge*; *Mr. Meeson's Will*; *Colonel Quaritch, V.C.*; *Cleopatra*; *Eric Brighteyes*; *Nada the Lily*; *Montezuma's Daughter*; *Joan Haste*; *Swallow: a Story of the Great Trek*; *Pearl-Maiden*; *Ayesha* (a continuation of *She*); *Red Eve*; *When the World Shook*; and *The Ancient Allan*. His tales are strong in incident and adventure, but weak in character-drawing. He also wrote *Rural England* (1902), *The Poor and the Land* (1905), and *Rural Denmark* (1911).

**Hagi**, a town of Japan in the south-west of the Island of Honshu. Pop. 25,000.

**Hague, The**, the third largest town in Holland, practically, though not formally, the capital of the Netherlands, is in the province of South Holland, 33 miles south-west of Amsterdam, and within 3 miles of the sea. It is the residence of the sovereign and of the foreign ambassadors, and the seat of the States-General of the Netherlands, and of the chief part of the central administration. Among the chief structures are the Binnenhof, founded in 1249, and containing the hall of assembly of the States-General, and various Government offices; the Groote Kerk; and the Mauritshuis, now converted into a picture gallery. The Palace of Peace, built at the expense of Andrew Carnegie, was opened in Aug., 1913. There are some manufactures—furniture, pottery, gold and silver wares, hats, &c. An international conference (the 'Hague Conference') was held here in 1899, at the suggestion of Tsar Nicholas II, and questions regarding the reduction of armaments, the use of inhuman practices in warfare, &c., were discussed, but the chief outcome was the establishment of a permanent court of arbitration, before which disputes among the different powers may be brought for peaceful settlement. Another conference was held at the Hague in 1907. Pop. 366,336.

**Hahnemann**, Samuel Christian Friedrich (1755–1848), German physician, the founder of the homœopathic system. After practising in various places, he published in 1810 his *Organon der rationellen Heilkunde*, which fully explained his new system of curing any disorder by employing a medicine which produces a similar disorder. (See *Homœopathy*.) Among

his other works are a *Dictionary of Materia Medica*, *Essay on Poisoning by Arsenic*, *On the Effects of Coffee*, and his treatise *On Chronic Affections*.

**Haifa**, a seaport of Palestine, on the south side of the Bay of Acre, at the foot of Mt. Carmel; starting-point of a railway to Damascus. Cotton is being grown locally and the trade is rapidly increasing. The harbour has 20 feet of water, and is being improved and extended. Pop. 24,634.

**Haig**, Douglas Haig, first Earl (1861–1928), British soldier. He was educated at Clifton and Brazenose College, Oxford, and in 1885 was gazetted to the 7th Hussars. In 1891 he was promoted captain, received a brevet majority in 1898, became a substantive major in the following year, received a brevet lieutenant-colonelcy in 1900, and was appointed to the command of the 17th Lancers with the substantive rank of lieutenant-colonel on the 16th July, 1901. As a captain he went to the Staff College at Camberley, and in 1898 was serving with the Egyptian army in the Sudan. On the first hint of trouble in South Africa, he received promotion to the appointment of Deputy Assistant Adjutant-General in South Africa. After the conclusion of peace with the Boers, Haig was sent to India as Inspector-General of Cavalry (1903–1906), after which he returned to England and was employed at the War Office first as Director of Military Training and later as Director of Staff Duties, where he had much to do with the creation of the General Staff. In 1909 he accepted the appointment of Chief of the Staff, Army Head-quarters, India, which he held until Feb., 1912. In that year he was ordered to England to take up the appointment of Commander-in-Chief, Aldershot Command, which he was still holding when the European War broke out. While Chief of Staff in India, Haig had been promoted lieutenant-general (31st Oct., 1910)—he had been a major-general since 1904—and in Aug., 1914, he stepped naturally into the position of Commander of the 1st Army Corps of the British Expeditionary Force. In November of the same year he was promoted to full General, and when in Dec., 1915, Sir J. French resigned the Chief Command of the British armies in France, it was Sir Douglas Haig, a full General of only twenty-nine years' service and in his fifty-fifth year of age,

who was selected by the Cabinet to succeed him in his difficult post. Some account of Earl Haig's services to his country will be found in the article *European War*. After the war he made the cause of the ex-service men his own, and spared no effort to obtain fair treatment for them. In 1921 he was presented with his ancestral estate of Bemersyde by the people of the Empire. He died in 1928, and, after lying in state in London and in Edinburgh, was buried in Dryburgh Abbey.

**Hail**, a town of Arabia, capital of the former central Arabian Emirate of Jebel Shammar. Pop. 10,000.

**Hail**, small masses of ice or frozen rain falling from the clouds in showers or storms, varying in their form as well as in their consistency, being sometimes as hard as ice and sometimes as soft as snow. Properly there are two kinds of hail—the small grains which generally fall in winter and usually before snow; and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates.

**Hailes**, David Dalrymple, Lord (1726–1792), Scottish lawyer, antiquary, and historian. *The Annals of Scotland* is the most important of his numerous writings.

**Hailsham**, Viscount. See *Hogg*, Sir Douglas.

**Hainan**, an island of China, belonging to the province of Kwangtung, between the China Sea and the Gulf of Tongking. It has an area of nearly 14,000 sq. miles. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of about 1,500,000, who cultivate rice, sugar, tobacco, &c. The fisheries are also productive. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. Some tin is mined. The capital is Kiung-chow, on the northern coast, a large seaport.

**Hainaut**, a province of Belgium, bounded south and west by France; area, 1437 sq. miles. It is hilly in the south-west, but elsewhere is comparatively level. The chief rivers are the Sambre, Dender, and Schelde. The soil is fertile (three-fourths of the area being arable), and cereals and beetroots are cultivated. The coal and steel districts around Mons and Charleroi form one of the greatest industrial areas in Europe. The principal manufactures are

cutlery, machinery, woollens, and linens. The capital is Mons. Pop. 1,235,196.

**Hainburg**, a town of Austria, on the Danube, 27 miles south-east of Vienna. It is walled and has an old castle. Pop. (district), 15,200.

**Hainichen**, a town of Saxony, 41 miles south-east of Leipzig. It has manufactures of woollen, linen, and cotton cloth, and is the chief seat of the German flannel manufacture. Pop. 8010.

**Haiphong**, chief port of the French colony of Tongking. The cotton manufacture is important. It was opened to foreign residence and trade in 1876. Pop. about 18,500.

**Hair**, the fine, thread-like, more or less elastic substance, of various form and colour, which constitutes the covering of the skin in the class of Mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of Mammalia is without hair in an adult state, not even the Cetacea. The human body is naturally covered with long hair only on a few parts, but the only places entirely free from it are the palms of the hands and the soles of the feet. Each hair consists of a shaft and a root. The shaft or part outside the skin does not grow; but the root embedded in the skin expands at its lower end into a swelling or bulb which is composed of little cells and grows by forming new cells, the old ones being pressed forward and becoming part of the shaft. The colour is due to minute pigment granules in the cells of the hair. The human hair varies according to age, sex, country, and circumstances. The hair of men is stronger and stiffer; that of females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. Each hair lasts only a certain time, after which it falls out and is replaced by another as long as the papilla is not weakened. Greyness of hair is caused by a deficient amount of pigment granules in the hair cells. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. Hair is the last thing which decays, and it often grows after death and lasts for centuries.

Hair for manufacture is obtained chiefly from the horse, the ox, the hog, the goat,

especially the Angora or Mohair goat, the camel, and the alpaca. That of the first three is most used for upholstery purposes. White hair is of the most value. The horse-hair used for weaving comes chiefly from Russia, Germany, Belgium, South America, and Australia. The sable, the miniver, the marten, and the badger supply the finer brushes or hair-pencils of painters. The hair of the goat, the camel, and the alpaca is chiefly used in combination with or subordinated to wool and other fibres for spinning and weaving into dress fabrics. Human hair is used chiefly for the manufacture of wigs, curls, beards, chignons, &c. Most of the supply comes from France, Germany, and Italy. In every case, and for any purpose, hair is always best taken from the living subject, dead hair being much inferior.

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who was selected by the Cabinet to succeed him in his difficult post. Some account of Earl Haig's services to his country will be found in the article *European War*. After the war he made the cause of the ex-service men his own, and spared no effort to obtain fair treatment for them. In 1921 he was presented with his ancestral estate of Bemersyde by the people of the Empire. He died in 1928, and, after lying in state in London and in Edinburgh, was buried in Dryburgh Abbey.

**Hail**, a town of Arabia, capital of the former central Arabian Emirate of Jebel Shammar. Pop. 10,000.

**Hail**, small masses of ice or frozen rain falling from the clouds in showers or storms, varying in their form as well as in their consistency, being sometimes as hard as ice and sometimes as soft as snow. Properly there are two kinds of hail—the small grains which generally fall in winter and usually before snow; and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates.

**Hailes**, David Dalrymple, Lord (1726–1792), Scottish lawyer, antiquary, and historian. *The Annals of Scotland* is the most important of his numerous writings.

**Hailsham**, Viscount. See *Hogg*, Sir *Douglas*.

**Hainan**, an island of China, belonging to the province of Kwangtung, between the China Sea and the Gulf of Tongking. It has an area of nearly 14,000 sq. miles. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of about 1,500,000, who cultivate rice, sugar, tobacco, &c. The fisheries are also productive. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. Some tin is mined. The capital is Kiung-chow, on the northern coast, a large seaport.

**Hainaut**, a province of Belgium, bounded south and west by France; area, 1437 sq. miles. It is hilly in the south-west, but elsewhere is comparatively level. The chief rivers are the Sambre, Dender, and Schelde. The soil is fertile (three-fourths of the area being arable), and cereals and beetroots are cultivated. The coal and steel districts around Mons and Charleroi form one of the greatest industrial areas in Europe. The principal manufactures are

cutlery, machinery, woollens, and linens. The capital is Mons. Pop. 1,235,196.

**Hainburg**, a town of Austria, on the Danube, 27 miles south-east of Vienna. It is walled and has an old castle. Pop. (district), 15,200.

**Hainichen**, a town of Saxony, 41 miles south-east of Leipzig. It has manufactures of woollen, linen, and cotton cloth, and is the chief seat of the German flannel manufacture. Pop. 8010.

**Haiphong**, chief port of the French colony of Tongking. The cotton manufacture is important. It was opened to foreign residence and trade in 1876. Pop. about 18,500.

**Hair**, the fine, thread-like, more or less elastic substance, of various form and colour, which constitutes the covering of the skin in the class of Mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of Mammalia is without hair in an adult state, not even the Cetacea. The human body is naturally covered with long hair only on a few parts, but the only places entirely free from it are the palms of the hands and the soles of the feet. Each hair consists of a shaft and a root. The shaft or part outside the skin does not grow; but the root embedded in the skin expands at its lower end into a swelling or bulb which is composed of little cells and grows by forming new cells, the old ones being pressed forward and becoming part of the shaft. The colour is due to minute pigment granules in the cells of the hair. The human hair varies according to age, sex, country, and circumstances. The hair of men is stronger and stiffer; that of females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. Each hair lasts only a certain time, after which it falls out and is replaced by another as long as the papilla is not weakened. Greyness of hair is caused by a deficient amount of pigment granules in the hair cells. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. Hair is the last thing which decays, and it often grows after death and lasts for centuries.

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**Hakluyt, Richard** (1553-1616), British geographer. He entered Christ Church, Oxford, in 1575, and eventually was appointed public lecturer on cosmography. About 1584 he went to Paris as chaplain to the English Ambassador, and stayed there five years. After his return home he prepared for the press his collection of *The Principal Navigations, Voyages, and Discoveries of the English Nation, made by Sea, or over Land, within the Compass of these 1500 Years*. The first volume, in folio, was published in 1589, and the third and last in 1600. Besides narratives of nearly 220 voyages, these volumes comprise patents, letters, instructions, and other documents not readily to be found elsewhere. Hakluyt died a prebendary of Westminster and rector of Wetheringset in Suffolk.

**Hakodate**, a city of Japan, near the south end of the Island of Hokkaido, on the shore of a spacious bay which forms one of the best harbours in the world. Hakodate is one of the ports opened to British commerce through Lord Elgin's treaty with the Japanese Government in 1858. The chief exports are beans, peas, sulphur, fur, and matches. The Hakodate fisheries are extensive and extremely productive. There is accommodation for vessels of 20,000 tons drawing 28 feet. There is one dry-dock 531 feet long. Pop. (1925), 163,972.

**Hal**, a town of Belgium, province of South Brabant, on the Senne, about 10 miles from Brussels. It has manufactures of beetroot sugar, soap, and leather. Pop. 13,000.

**Halacha**, or **Halaka**. See *Talmud*.

**Halberstadt**, a town of Prussia, in the province of Saxony, on the right bank of the Holzeme. It has considerable manufactures of carpets, soap, leather, oil, and gloves. Pop. 46,480.

**Haldane, Richard Burdon**, first Viscount (1856-1928), British philosophical writer and politician. He entered Parliament as Liberal member for Haddingtonshire in 1885, a constituency which he represented till 1911. In 1890 he became Queen's Counsel, in 1902 a Privy Councillor, and in 1911 he was raised to the peerage. From 1905 to 1911 he occupied the post of Secretary of State for War, and was able to carry into effect a new scheme of army organization. From 1912 to 1915 he was Lord High Chancellor of

Great Britain. He held this post again from Jan. to Oct., 1924. He was Gifford Lecturer at St. Andrews University from 1902 to 1904, and has written *The Life of Adam Smith*, *Education and Empire*, *The Pathway to Reality*, *The Reign of Relativity*, and *The Philosophy of Humanism*.

**Hale, Sir Matthew** (1609-1676), English judge. He became a judge of the common bench in 1654, was made chief baron of the exchequer in 1660, and was raised to the chief-justiceship of the King's Bench in 1671. After his death appeared his *History of the Pleas of the Crown*, *The Jurisdiction of the Lords' House*, and *The History of the Common Law of England*; of which there have been repeated editions, with comments.

**Haleb**, Arabian name for Aleppo (q.v.).

**Hales, Alexander de**. See *Alexander of Hales*.

**Halesowen**, a market town of England, Worcestershire, in a fertile valley 7 miles south-west of Birmingham; with manufactures of iron and steel goods, &c. Pop. (1931), 31,058.

**Halévy, Jacques François Fromental Élie** (1799-1862), French musical composer. The first of his pieces performed was a little comic opera, *L'Artisan*, given at the Théâtre Feydeau, in Paris, 1827. His *chef-d'œuvre*, *La Juive*, appeared in 1835. Among his other works are: *L'Éclair*, *Guido et Ginevra*, *La Reine de Chypre*, *Le Val d'Andorre*, and *La Fée aux roses*.

**Halévy, Ludovic** (1834-1908), French author. He was a popular author of vaudevilles, and wrote the libretti of most of Offenbach's operas. He collaborated with Henri Meilhac, and their first success was *La Belle Hélène* (1865). Halévy also wrote novels, among which *L'Abbé Constantin* (1882) is famous.

**Halfa**, a province, Anglo-Egyptian Sudan; area, 112,300 sq. miles; pop. 40,708. The chief town is also called Halfa.

**Half-pay**, in effect a species of temporary pension. The most usual reason for being placed on the half-pay list is medical unfitness contracted in the service. The rates of half-pay vary, for example, from £1800 a year for a field-marshal, £3, 5s. a day for a full general, 18s. 6d. for a senior major, to 9s. 6d. for a subaltern.

**Haliaëtus**. See *Eagle*.

**Haliburton, Thomas Chandler** (1796-1865), British writer. He practised as a

barrister in Halifax (N.S.), and contributed a series of humorous letters to a Halifax paper under the pseudonym of 'Sam Slick'. These were published in book form and were augmented by others, forming *The Clockmaker, or Sayings and Doings of Samuel Slick*. In 1842 he became judge of the Supreme Court of Nova Scotia. After settling in England he wrote *The Attaché, or Sam Slick in England*.

Halibut, the *Hippoglossus vulgaris*, one of the largest of the flat-fish family, sometimes attaining a length of over 10 feet and weighing more than 300 lb. It is much prized for the table.

Halicarnassus, in ancient geography, the capital of Caria, in Asia Minor, once an important city.

Halifax, Charles Montague, Earl of (1661-1715), English poet and statesman. Educated at Westminster School and Trinity College, Cambridge, he first attracted notice by his verses, and in 1687 wrote, in conjunction with Matthew Prior, *The Country and City Mouse*. He became a Lord of the Treasury in 1692, and Chancellor of the Exchequer in 1694. His administration was distinguished by the adoption of the funded debt system, and by the establishment of the Bank of England. In 1714 he became First Lord of the Treasury.

Halifax, George Savile, Marquess of (1630-1695), English statesman and writer. In the reign of Charles II he was Keeper of the Privy Seal and President of the Council. He was chosen Speaker of the House of Lords in the Convention Parliament, and largely contributed to the elevation of William III to the throne. He wrote *Advice to a Daughter*, and various political tracts, such as the *Character of a Trimmer*, and *Maxims of State*.

Halifax, a borough of England, in the county of York (West Riding), on the Hebble, 36 miles w.s.w. of York. Halifax commands abundant supplies of coal, and inland waterways connect it with Hull and Liverpool. It is one of the centres of the woollen and worsted manufactures in Yorkshire, a great variety of goods being produced. There are also iron, chemical, and machine-works. Pop. (1931), 98,122.

Halifax, a Canadian city and naval station, capital of Nova Scotia, situated near the middle of the south coast, on the western side of Halifax harbour, one of

the best and most spacious in North America, and easy of access for the largest ships at all seasons. The length of the harbour is about 6 miles. City and harbour are strongly fortified, and there is an extensive dockyard, with a great graving-dock. Being the Atlantic terminus of great railway systems, and a winter port, it has a considerable steamship trade, and is also an important coaling-station. The industries embrace cotton, sugar, iron, paint, machinery, cars, and paper. There are also shipyards, an oil refinery, and important industries connected with the fisheries. Pop. 58,372.

Haliotis, a genus of sea-snails, commonly called *ormers*, *ear-shells*, or *sea-ears*, found adhering to rocks on the shore, and valuable for their mother-of-pearl.

Hall, Edward (c. 1498-1547), English chronicler. He was a lawyer by profession, and attained the rank of a serjeant, and the office of a judge in the sheriff's court. Hall's great work, *The Union of the Noble and Illustre Famelies of Lancastre and York*, known as *Hall's Chronicle*, was first published in 1542.

Hall, Joseph (1574-1656), English bishop and satirist. He was educated at Emmanuel College, Cambridge, became successively Dean of Worcester, Bishop of Exeter (1627), and Bishop of Norwich (1641). He agreed with the Puritans in doctrine, but disapproved of their views of church government, and took a prominent part in defending the liturgy of the Church against the views published by the Nonconformists in the tract *Smectymnus*. In 1642 he was sent to the Tower, his revenues were sequestered, and his property appropriated. Amongst his writings are: *Virgidemitarum*, a series of poetical satires written in his earlier years; *A Century of Meditations*; and *Contemplations*.

Hall, Robert (1764-1831), English Baptist minister. He acquired a great reputation by his preaching and his writings, such as *Apology for the Freedom of the Press* (1793), *Modern Infidelity* (1800), and *Reflections on War* (1802).

Hall, an ancient town of Austria, in the Tirol, 6 miles east of Innsbruck, on the Inn, which is here navigable. It has salt-works connected with the Salzberg (2000 feet). Pop. 7520.

Hallam, Henry (1777-1859), English historian. His contributions to the *Edin-*



*burgh Review* brought him into notice, and his *View of the State of Europe during the Middle Ages* (1818) established his reputation. His next work was his *Constitutional History of England* (1827). Between 1837 and 1839 appeared his last work, the *Introduction to the Literature of Europe*, a useful survey of literary history. His eldest son, Arthur Henry, who died suddenly at the age of twenty-two, is the subject of Tennyson's poem *In Memoriam*.

Halland, a län or government of Sweden; area, 1900 sq. miles; pop. 150,071. Timber, granite, fish, and oats are the chief exports. Halmstad is the chief town.

Halle, an important German town in the Prussian province of Saxony, about 20 miles north-west of Leipzig, on the River Saale. Among the principal buildings are the 'Red Tower' (a clock-tower) in the market-place and the mediæval town-house. The university, with which that of Wittenberg was incorporated in 1817, is a celebrated institution founded in 1694. The town has extensive trade and manufactures, including chemicals, oils, dyes, and agricultural and other machines, besides its old and celebrated salt-works. Pop. (1925), 194,636.

Halleck, Fitz Greene (1790-1867), American poet. In 1820 he published *Fanny*, his longest poem, a satire on the follies and fashions of the day. Amongst his other poems are: *Marco Bozzaris*, *To the Memory of Burns*, *Atwick Castle*, and *Red Jacket*.

Halleck, Henry Wager (1815-1872), American general. On the outbreak of the Civil War in 1861 he was created major-general in the United States army. After the victories at Paducah, Fort Henry, Fort Donelson, and the capture of Corinth, he became in 1862 commander-in-chief, till superseded by General Grant in 1864. Amongst his writings are two works on *International Law*.

Halley, Edmund (1656-1742), English mathematician and astronomer. In 1682 he discovered the comet which bears his name, and his prediction of its return in 1759 was the first of its kind that proved correct. He surveyed the coast of Dalmatia at the request of the German Emperor, and, returning to England, was elected Savilian professor of geometry at Oxford (1703). In 1713 he was made secretary of the Royal Society, and Astronomer Royal in 1719. Among scientific men of

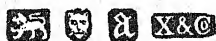
his time, Halley ranked next to Sir Isaac Newton, with whom he had close associations.

Halliwell-Phillipps, James Orchard, originally J. O. Halliwell (1820-1889), English Shakespearean scholar. His chief Shakespearean publications are a *Life of Shakespeare* (1848), the *Works of Shakespeare* (in 16 folio volumes, only 150 copies printed), *Calendar of the Records of Stratford-on-Avon*, *History of New Place*, and *Outlines of the Life of Shakespeare*. He issued also 47 volumes of lithographed facsimiles of the quarto plays, and a great number of pamphlets on Shakespeare, Stratford, and kindred topics.

Hall Land, a part of North-West Greenland.

Hall-marks, the marks stamped on plate and other gold and silver goods, by means of which the quality (standard of precious metal contained), the maker, and the date of manufacture may be recognized. In the thirteenth century the London Guild of Goldsmiths and Silversmiths had attained great importance, a large monopoly, and numerous privileges. In order to ensure a high standard, each piece of plate was assayed and marked. The *King's Mark*, so named in 1363, was introduced in 1300 as a leopard's head; really a lion's head, miscalled leopard's owing to the heraldic term *leopard* being applied to a *lion passant guardant*. This mark, the hall-mark proper, still remains in use on London plate; the form has often changed in detail, the present head being much less bold in style than the original. The *maker's mark*, originally such a symbol as a fish, bird, horse, or—frequently—a rose or other flower, dates from 1363. In 1696 it was changed to the first two letters of the maker's name, and now consists of his initial. The *date mark*, first used in the fifteenth century—the earliest known example being that on the Nettlecombe chalice of 1479—is a single letter of the alphabet from A to U, J being excluded. One of several different forms of alphabet is used for a cycle of twenty years and then changed. The shape of the shield enclosing the letters also varies; and in this way, the sequence of the cycles being known, the date of a marked piece is readily identified. *Duty mark*: this, the head of the reigning sovereign, was added in 1784, but disappeared in 1890 with the abolition of the duty upon plate.

The *standard mark*, a lion for London, must be sent to London, there to be Birmingham, and Chester, denotes the assayed and marked; but difficulties of standard proportion of 11 oz. 2 dwt. of transit early led to the tacit recognition



London marks for the first year of the current cycle (1916); lion passant to indicate standard quality, leopard's head, the London hall-mark; date letter; and maker's initials.



A characteristic London date mark from each cycle of 20 years, commencing in the year specified above the mark.



Duty marks indicating payment of duty, which was imposed only between 1784 and 1890. The two marks 1697-1718 on right were used when the standard was raised to 11 oz. 10 dwt., and may still be used for that standard. The usual one of 11 oz. 2 dwt. was restored in 1720 with the leopard's head and lion passant.



Town marks and the periods during which they have been used. York, Exeter, and Newcastle are now closed.



Scottish and Irish hall-marks and standard marks. The shape of the punch varies from time to time.

silver to 18 dwt. of alloy; other marks denote various proportions of silver, while yet others are employed for gold and by the provincial assay towns. Nominally it was held that provincially-made plate

of provincial assays and marks, made either by the mayor, or, where a mint existed, by the master of the mint. York had in 1410 its own assay or 'touch'—so called from the primitive early method of rubbing the article upon a stone to test the quality; and in 1423 local assays were legalized for York, Newcastle, Lincoln, Norwich, Bristol, Salisbury, and Coventry. The marks of some of these towns, as also those of the present provincial assays (Birmingham, Chester, Sheffield, Edinburgh, Glasgow, Dublin), will be found in the accompanying cuts.—Cf. C. J. Jackson, *English Goldsmiths and their Marks*.

**Hallowe'en**, the evening of the 31st of Oct., so called as being the eve or vigil of All Hallows, or All Saints, which falls on the 1st of Nov. It is associated in the popular imagination with the prevalence of supernatural influences, and in Scotland is frequently celebrated by the performance of various mystical ceremonies humorously described by Burns in his poem *Hallowe'en*.

**Hallucinations**, according to Esquirol, are morbid conditions of mind in which the patient is conscious of a perception without any impression having been made on the external organs of sense. Hallucinations are to be distinguished from illusions, for in these there are real sensations, though they are erroneously interpreted. Pinel was the first who connected hallucinations with a disturbance of the phenomena of sensation. All the senses are not equally subject to hallucinations; the most frequent are those of hearing. The simplest form of hallucinations of hearing is the tingling of the ears; but the striking of clocks, the sounds of musical instruments and of the human voice are often heard, and in these

instances, as in those of the perturbations of the other senses, there must be a diseased sensorium, though there should be no structural derangement of the nerves. Hallucinations may be caused by some experience

which excited the emotions with such intensity that the patient represses the memory of the painful episode; in sleep, or at times when the repressive forces are relaxed, the memory of the experience is apt to force itself into consciousness in a more or less distorted form as a hallucination of vision, hearing, &c.—BIBLIOGRAPHY: J. E. D. Esquirol, *Mental Pathology*; W. James, *The Principles of Psychology*; E. Parish, *Hallucinations and Illusions*.

**Halluin**, a town of France, department of Nord, on the right bank of the Lys, 10 miles N.N.E. of Lille. It has considerable manufactures of cloths, linen, and calicoes, besides cotton- and oil-mills. Pop. 16,000.

**Halmstad**, a seaport of Sweden, on the Kattegat, at the mouth of the Nissa. It has cloth-making, brewing, salmon fisheries, and a trade in deals, lumber, and pitch. The harbour is safe and accommodates vessels drawing 20 feet. Pop. 18,430.

**Halo**. (1) *Halos proper* are due to refraction of light through minute crystals of ice, which are mostly right hexagonal prisms. The halo most often seen has a radius of 22°; less frequently one of 46° radius is visible. Parhelia or mock suns, and paraselenae or mock moons, when seen, appear at about 22° to right or left of the actual luminary. (2) *Coronas* are much smaller rings surrounding sun or moon and produced by diffraction of light. They are variable in size, and often show prismatic colour strongly, violet on the inside, red on the outside.

**Halogens** (salt producers), the name given to a group of chemically related elements: fluorine, chlorine, bromine, and iodine. Of these fluorine is the most active chemically, and iodine the least active. Fluorine and chlorine are greenish gases at ordinary temperature, bromine a brown liquid, and iodine a blackish solid. The halogens unite readily with hydrogen, forming important acids, e.g. hydrochloric acid; and with the metals, forming salts, as sodium chloride.

**Hals**, Frans (1580-1666), Dutch painter. Among the most notable work of his earlier period are *The Laughing Cavalier*, in the Wallace Collection, and the groups of the Haarlem Guild of Archers, in Haarlem; while characteristic of the later work are the groups *The Regents* and *The Regentesses*, at Haarlem. Hals is chiefly

notable for the vitality and vigour of his portraits, and his brilliant and direct handling. A brother, Dirk, and several sons, notably Frans the Younger, were also painters of some note.

**Halsbury**, Hardinge Stanley Giffard, first Earl of (1823-1921), British lawyer and politician. He was called to the Bar at the Inner Temple in 1850, and became a Q.C. in 1865. He was Solicitor-General from 1875 to 1880, and sat as Conservative member of Parliament for Launceston from 1877 to 1885. He was Lord High Chancellor of England from June, 1885, to Jan., 1886, from July, 1886, to Aug., 1892, and from June, 1895, to Dec., 1905. As Lord Chancellor he did much to adapt English common law to the changing conditions of the times. He was editor of *The Laws of England*, and Senior Grand Warden of English Freemasons.

**Hälsingborg**, a seaport in Sweden on the Sound opposite Helsingör. It has tanneries, dye-works, salt-works, and a good harbour with 32 feet of water alongside, a dry-dock, shipbuilding and repair yards, and coal and oil fuel. Pop. 48,390.

**Halstead**, a town of England, county of Essex, 16 miles from Colchester. Pop. (1931), 5878.

**Haltwhistle**, a town of England, in the S.W. of Northumberland, on the South Tyne, with coal-mines in the neighbourhood. Pop. (1931), 8909 (rural district).

**Ham**, a town of France, department of Somme, on the Somme. It contains a citadel which served as a State prison. Pop. 3000.

**Hamadan**, a city of Persia, in the province of 'Iraq-Ajemi, 260 miles north-west of Isfahan. It has extensive caravanserais and bazaars, a number of tanneries, and manufactures of carpets, woollens, and cotton stuffs. It is an important centre of trade, especially for goods passing in or out of Persia by way of Baghdad. Pop. about 35,000.

**Hamah**, a city of Syria, on the banks of the Orontes, on the caravan route between Aleppo and Damascus, and on the railway that runs northwards towards Aleppo from the Beirut-Damascus line, in a well-watered and productive district. It is a flourishing place, with manufactures of cotton and silk, but is of chief importance as an agricultural centre. Amongst the curiosities are huge Persian water-wheels, 70 or 80 feet in diameter, which are turned

by the current of the river and supply the houses and gardens with water. Pop. 45,000.

**Hamamatsu**, a town of Japan, Island of Honshu, 125 miles east of Osaka. Pop. (1925), 92,152.

**Hamamelidaceæ**, the witch-hazels (or wych-hazels), a small natural order of dicotyledonous trees or shrubs, varying in height from 6 to 30 feet.

**Hamburg**, a seaport and free city of Germany, the greatest commercial port on the continent of Europe, is situated about 80 miles from the North Sea, on the north branch of the Elbe, which is navigable for large vessels. From the Elbe proceed canals which intersect the eastern and lower part of the city in all directions, and it is also intersected by the Alster, which here forms two fine lakes, the Binnenalster and Aussenalster. Hamburg is of most importance on account of its great shipping trade and the business of banking, exchange, and marine assurance carried on in connexion with that. Its manufactures and kindred industries include shipbuilding, the making of machinery, boilers, and many articles of metal, the smelting of ores of various kinds, tobacco- and cigar-making, sugar refining, spirit refining and distilling, brewing, &c. The harbour accommodation and equipment are most complete, and ships of all sizes can be berthed and dry-docked. There is a free harbour. The state of Hamburg, which with the free city forms a republic, embraces a territory of 160 sq. miles, and consists of two divisions: (1) City of Hamburg, with a population of (1925) 1,127,834; (2) outlying towns (Cuxhaven, Ritzbüttel, &c.), pop. (1925), 80,605. According to the Constitution of 1921 the legislative power belongs in common to the Senate and the House of Burgesses, but the executive power is vested chiefly in the Senate. The city owes its foundation to the Emperor Charlemagne. It became important as a commercial city in the twelfth century, and in the thirteenth it combined with Lübeck in forming the Hanseatic League. In 1618 Hamburg was formally acknowledged a free city of the empire. In 1810 it was incorporated in the French Empire along with the north-western part of Germany, but in 1815 it joined the Germanic Confederation as a free city. In 1888 the city was included in the Zollverein or

German Customs Union.—**BIBLIOGRAPHY:** W. Böttcher, *The Port of Hamburg*; W. King, *Three Free Cities*.

**Häme**, a department of Finland; area, 6742 sq. miles; pop. 364,430. The chief town is Tavastehus.

**Hameln**, a town of Germany, in Hanover, on the Weser. The industries include spinning, sugar-refining, and salmon-fishing. Pop. 22,061.

**Hami**, a town in the north-east of Sinkiang, Chinese Turkistan, on the road from Peking to Kashgar. It is an extremely important trading centre. Pop. 5000.

**Hamilcar**, the name of several Carthaginian generals, of whom the most celebrated was Hamilcar (c. 270–229 B.C.), surnamed Barca (the lightning), the father of the great Hannibal. While quite a young man he was appointed to the command of the Carthaginian forces in Sicily, in the eighteenth year of the first Punic War, 247 B.C. For two years he defied all the efforts of the Romans to dislodge him; but the Carthaginian admiral, Hanno, having been totally defeated off the Ægates, 241 B.C., he reluctantly consented to evacuate Sicily. He then entered on a series of campaigns in Spain, where he passed nine years, and brought the whole southern and eastern part of the country under Carthaginian rule.

**Hamilton**, Alexander (1757–1804), American statesman and economist. On the outbreak of the war he received (1776) a commission as captain of artillery, and soon attracted the attention of Washington, who appointed him his aide-de-camp. On the organization of the Federal Government in 1789, with Washington at its head, Hamilton was appointed Secretary of the Treasury. This office he held till 1795, when he resigned and retired into private life. In 1804 he became involved in a political dispute with Aaron Burr, then candidate for the governorship of New York, accepted a challenge from that gentleman, and was shot by him.

**Hamilton**, Anthony, Count (1646–1720), French writer. He is chiefly known by his *Memoirs of Count Gramont* (his brother-in-law), a lively and skilful picture of the frivolous life at the French and English courts of the time. The count's other works are *Poems and Fairy Tales* (burlesque), which, as well as the *Memoirs*, are in French, and are also remarkable for their fine wit and elegance of style.



**Hamilton, Emma, Lady** (c. 1765–1815), mistress of Lord Nelson. After being his mistress, at the age of thirty years she became the wife of Sir William Hamilton, British Ambassador at Naples. It was while in this position that she made the acquaintance of Lord Nelson, who became devoted to her, although she was an ignorant woman, and set no bounds to her flatteries of Nelson.

**Hamilton, Sir Ian Standish Monteith** (1853– ), British soldier. He saw service in the Afghan War (1878–1879), the Boer War of 1881, and in Burma (1886–1887). During the South African War he was at Ladysmith as chief of the staff to Sir George White. He commanded the forces which landed on the Gallipoli Peninsula. His works include: *A Staff Officer's Scrap Book*, *Icarus, Fighting of the Future*, and *A Gallipoli Diary*.

**Hamilton, Patrick** (1504–1528), Scottish reformer. He was summoned in 1526 by Archbishop Beaton to stand his trial for heresy. He fled to Germany, where his education as a reformer was completed by an intimate acquaintance with Luther and Melancthon. After six months' absence he returned to Scotland, and began to preach the gospel openly at Linlithgow, but was allured by Beaton to St. Andrews under pretence of a friendly conference, put on his trial, convicted of various heresies, and burned at the stake.

**Hamilton, Sir William** (1730–1803), British diplomatist and archaeologist. In 1764 he received the appointment of Ambassador to the court of Naples. He took an active part in the excavation of Herculaneum and Pompeii, and collected a cabinet of antiquities, of which an account was published by D'Hancarville in a splendid work with finely-coloured plates. Sir William's second wife was the notorious Lady Hamilton (see *Hamilton, Emma, Lady*).

**Hamilton, Sir William** (1788–1856), Scottish metaphysician. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. Here he gathered about him a number of ardent students, and re-established the fame of the Scottish school of metaphysicians, which had begun to wane. In 1846 he published an annotated edition of the works of Thomas Reid, and in 1854 the first volume of a similar edition of the

works of Dugald Stewart. His lectures on logic and metaphysics were collected and edited by Dean Mansel and Professor Veitch. Hamilton's most important contributions to philosophy are connected with his doctrine of the Quantification of the Predicate in his system of logic; his theory of the 'relativity of knowledge', in the Kantian sense, held along with an apparently incompatible doctrine of immediate perception of the non-ego; and his definition of the infinite or unconditioned as a mere negation of thought.—**BIBLIOGRAPHY:** J. Veitch, *A Memoir of Sir W. Hamilton*; J. Seth, *English Philosophers and Schools of Philosophy*.

**Hamilton, Sir William Rowan** (1805–1865), Irish mathematician and astronomer. He was appointed in 1827 professor of astronomy in Trinity College, as well as Astronomer Royal. He was knighted in 1835, and elected in 1837 president of the Royal Irish Academy. His fame is chiefly founded on his invention of the calculus of quaternions, a vector method of great value in geometry and physics. Amongst his published works are: *General Method in Dynamics*, *Algebra as the Science of Pure Time*, and *Memoirs on Discontinuous Functions*.

**Hamilton, Family of**, a family long connected with Scotland, though probably of English origin. The first person of the name in Scotland of whom we have reliable information was Walter Fitz-Gilbert of Hamilton, who, in 1296, swore fealty to Edward I of England for lands in Lanarkshire, and held Bothwell Castle for the English at the time of the battle of Bannockburn. In 1445 the family was ennobled in the person of Sir James Hamilton of Cadzow. James, the third marquess, one of the ablest and most distinguished of the family, created Duke of Hamilton in 1643 by Charles I, was taken prisoner by the Parliamentary forces soon after the battle of Preston, and beheaded in March, 1649. A successor was created Duke of Brandon in 1711, and was killed in a duel with Lord Mohun in 1712. James George, seventh duke, on the death of Archibald, Duke of Douglas, in 1761, became also the male representative and chief of the red or Angus branch of the House of Douglas, with the titles of Marquess of Douglas and Earl of Angus. The Duke of Hamilton is the Premier Peer of Scotland, and is Hereditary Keeper of

Holyrood Palace.—*Cf. J. Anderson, The House of Hamilton.*

**Hamilton**, a royal burgh of Scotland, in Lanarkshire, on the Clyde, about 10 miles south-east of Glasgow. Coal, ironstone, and limestone are extensively worked in the vicinity. Hamilton has very large barracks, and is a regimental depot. Hamilton Palace was dismantled in 1921. In the adjacent grounds are the ruins of Cadzow Castle, and a few old oaks, the remains of Cadzow Forest. Here a herd of wild cattle is kept. Pop. (1931), 37,863.

**Hamilton**, the inland metropolis of the western district of Victoria, Australia. The district is pastoral and agricultural. Pop. 5100.

**Hamilton**, a town of New South Wales, Australia, 100 miles north of Sydney. There are collieries giving employment to a number of hands. Pop. 7900.

**Hamilton**, the capital of the Bermudas, on the coast of the largest island. It has a landlocked harbour. Pop. 2578.

**Hamilton**, a city of Canada, the third largest in the province of Ontario, situated on Burlington Bay, at the west end of Lake Ontario. It is on the edge of the Niagara Peninsula, and thus belongs to the finest fruit-growing district in Canada, and is an important railway centre on the C.N.R. and C.P.R. It is the seat of an active trade, and manufactures large quantities of iron goods, including machinery and stoves. Pop. 120,235.

**Hamilton**, a town of North Island, New Zealand, situated 70 miles s.s.e. of Auckland. It is the centre of a dairying district. Pop. (1927), 17,140.

**Hamilton**, a town, Ohio, U.S.A., on the Miami River, north of Cincinnati. It is a prosperous manufacturing place, has woollen- and cotton-factories, paper- and saw-mills, and iron-foundries. Pop. 41,458.

**Hamm**, a town of Prussia, in the Westphalian coal-fields, at the confluence of the Ahse with the Lippe. Its industries embrace iron-foundries and machine-works, rolling-mills and puddling-works, and wire-works. Pop. 43,660.

**Hamme**, a town in East Flanders, Belgium, with textile manufactures and flour- and oil-mills. Pop. 14,000.

**Hammerfest**, a seaport in Norway, in Finnmarken, on Hvaløe (Whale Island), a bare, treeless, barren spot, the most northerly town in the world. It is a

fishing centre, and carries on a good trade in fish and fish products. Though within the Arctic circle, the winter is comparatively mild, and the surrounding waters seldom freeze. Pop. 2709.

**Hammersmith**, a borough of London, about 6 miles w.s.w. of the General Post Office. Pop. (1931), 135,521.

**Hammond**, a city of Indiana, U.S.A., 21 miles s.s.e. of Chicago. The main industries are meat packing and canning and the manufacture of chemicals. Pop. 36,004.

**Hammurabi** (c. 2250 B.C.), King of Babylonia. He did much for the welfare of the country, encouraging agriculture and commerce by irrigation and otherwise, regulating the finances, and building temples. To him is attributed a code of laws discovered in the end of 1901, inscribed upon a block of stone found in the ruins of Susa, and extending to 282 paragraphs, being the oldest law-book known.

**Hampden**, John (1594–1643), English statesman. He entered Parliament in the beginning of Charles I's reign as member for Grampound. Although for some years a uniform opposer of the arbitrary practices in Church and State, it was not till 1636 that his resistance to Charles's demand for ship-money brought him prominently into notice. Although the decision in the Court of Exchequer was given against him by seven voices to five, the victory, as far as regarded public opinion, was his. He was one of the five members whom the king, in 1642, attempted to seize in the House of Commons. When the appeal was made to the sword, Hampden accepted the command of a regiment in the Parliamentary army under the Earl of Essex, and was fatally wounded on Chalgrove Field.

**Hampshire**, Hants, or Southamptonshire, a maritime county, including the Isle of Wight, in the south of England; area, 958,896 acres. Its surface is varied with gently rising hills, fruitful valleys, and extensive woodlands. The coastline is very irregular; the principal indentation, Southampton Water, is navigable almost to its head for vessels of considerable burden. The country is well watered by the Avon, Exe, Test, Itching, and Hamble. In the west is the New Forest; in the south-east are the Forests of Bere and Waltham Chase. Two ranges of chalk

hills, the North and South Downs, traverse the county. On the Downs large flocks of sheep known as the 'Hampshire Downs' are fed. Hampshire is also famous for its wool, bacon, honey, and timber. The manufactures are unimportant, but the shipping is very extensive. Winchester is the capital, the largest towns are Southampton and Portsmouth, and other well-known places are Bournemouth, Southsea, Aldershot, and Andover. Pop. (1931), 1,014,115.

**Hampstead**, a borough of London. It is situated on the declivity of a hill on the north-western side of the city, and has long been celebrated for its fine air and the beauty of its surroundings. Hampstead Heath crowns the summit of the hill, and is one of the most frequented of public recreation grounds. Pop. (1931), 88,914.

**Hampton**, a village of Middlesex, 14 miles south-west of London, on the left bank of the Thames. Pop. (1931), 13,053. About a mile from the village are the palace and park of Hampton Court, built by Cardinal Wolsey in 1525, used as a residence by many sovereigns, and now occupied by royal pensioners. The gardens, which contain the Maze, the Grape Vine, and the Long Water, comprise about 44 acres.

**Hampton Court Conference**, a conference which took place in 1604 at Hampton Court, under the presidency of James I, between the representatives of the Episcopalian and Puritan parties in the Church. It did little except determine that a new version of the Bible should be undertaken. This, the Authorized Version, appeared in 1611.

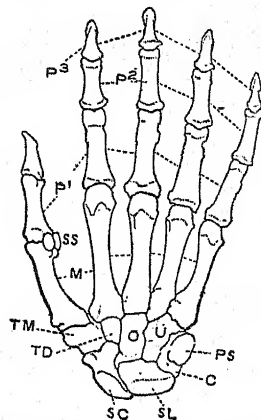
**Hamster** (*Cricetus*), a genus of rodent animals belonging to the family Muridae, closely allied to the rats. They have short, hairy tails and cheek pouches. The common hamster (*C. frumentarius*) measures about 14 inches including its tail. It is a destructive animal found in the north of Europe and Asia but not in Britain. It is carnivorous as well as graminivorous, and hibernates during the colder months.

**Han**, a river of China rising in the Ta-pa-ling Mountains and flowing to join the Yangtze Kiang at Hankow. It is 1300 miles long, and is navigable for large junks to Fancheng.

**Hanau**, a town of Prussia, province of Hesse-Nassau, at the confluence of the Kinzig with the Main, 13 miles east of

Frankfurt. It is the chief manufacturing town in the province. It has manufactures of jewellery, carpets, tapestry, silk and woollen goods, and ironware. Pop. 37,470.

**Hand.** The skeleton of the human hand is composed of twenty-seven bones, the eight of the carpus or wrist, the five forming the palm, and the fourteen (phalanges) of the fingers proper. The chief muscles which determine the movements of the fingers are the *flexors*, which pass



Skeleton of Human Hand and Wrist

SC, Scaphoid. SL, Semilunar. C, Cuneiform. PS, Pisiform. TM, Trapezium. TD, Trapezoid. O, Os magnum. U, Unciform. M, The five metacarpal bones. P<sup>1</sup>, P<sup>2</sup>, P<sup>3</sup>, Three rows of phalanges. SS, Sesamoid bones.

down the forearm, and the *extensors* for extending the fingers. The tendons of the muscles of the hand are interlaced and bound together by bands and fibres, and from this results a more or less complete unity of action. Of all the properties of the hand the opposition of the thumb to the other fingers, alone or united, especially characterizes the human hand. As a tactile instrument and a means of discriminating form, size, weight, and texture the human hand is one of the essential elements in man's intellectual supremacy. It cannot be considered, as in the ape, a normal organ of locomotion. It is essentially the organ of touch and prehension. The functions of touch devolve principally upon its anterior or palmar face, the nervous

papillæ abounding specially at the ends of the fingers. A layer of adipose tissue, very close in texture, protects, without lessening its power or its delicacy, the network of muscles, vessels, and nerves.

**Handel**, George Frederick (1685–1759), German musical composer, long resident in England. In 1704 he brought out his first work, an oratorio on the *Passion*, and his first opera, *Almira*, followed in February by his *Nero*, and subsequently by his *Florinda* and *Daphne*. In 1706 he went to Italy, visiting Florence, Venice, Naples, and Rome. On his return to Germany he entered the service of the Elector of Hanover, afterwards George I of England, as musical director. He visited England twice, and ultimately, having received a pension from Queen Anne, settled down there. Amongst the operas which he composed are: *Radamisto*, *Ottone*, *Giulio Cesare*, *Flavio*, *Tamerlano*, *Scipio*, *Ricardo I*, *Orlando*, and *Ariadne*. His last opera was performed in 1740. By this time he had begun to devote himself chiefly to the oratorio. The approval which his first works of this kind (*Esther*, 1731; *Deborah*, 1732; *Athalie*, 1733) had met with encouraged him to new efforts; and he produced in succession *Israel in Egypt*, *L'Allegro and Il Penseroso*, *Saul*, and *The Messiah*. The last mentioned was brought out in 1741 for the benefit of the Foundling Hospital. In 1742 the *Samson* appeared, in 1746 the *Judas Maccabæus*, in 1748 the *Solomon*, and in 1752 the *Jephthah*. In 1752 he became blind. As a musician his characteristics are boldness and strength of style and combination of vigour, spirit, and invention in his instrumental compositions.—Cf. R. A. Streatfield, *Handel*.

**Handsworth**, a suburb and parliamentary division of Birmingham, England. In 1931 the population of the division was 72,622.—Another *Handsworth* is in the West Riding of Yorkshire, forming an urban district 3 miles south-east of Sheffield, with collieries, quarries, &c. Pop. 15,889.

**Hangchow**, a Chinese treaty port, capital of the province of Chekiang, on the estuary of the Tsien-tang-kiang. It has extensive manufactures in silks, furs, gold and silver ornaments, tapestries, lacquered ware, fans, &c., and a large trade. It is a great centre of literary and ecclesiastical life. Pop. estimated at 892,100.

**Hangö**, a seaport of Finland, at the

mouth of the Gulf of Finland. The harbour, which is open all the year round, has accommodation for the largest vessels. Timber, paper, butter, and tar are exported. Pop. 7000.

**Hankow**, a town and river-port in China, in the province of Hupeh, at the junction of the Han with the Yangtze Kiang; Hanyang (pop. 100,000) being on the opposite bank of the Han, and Wuchang on the other side of the Yangtze. The port was opened to foreign trade in 1862, and has become the chief emporium for the great tea districts in the central provinces. Ocean-going steamers can ascend to the town in summer. Hankow, Hanyang and Wuchang, under the collective name of Wuhan, form the capital of Southern China. Pop. 1,474,400.

**Han-Kiang**, a Chinese river rising in Hupeh and joining the Yangtze Kiang near Hankow. It is 900 miles long.

**Hanley**, a former town of Staffordshire, England, now incorporated in Stoke-on-Trent, of which it forms a parliamentary division. It owes its growth entirely to the vast manufactures of china and earthenware in which the inhabitants are mostly employed; there are also iron-furnaces, foundries, brickworks, and collieries. The population of the parliamentary division in 1931 was 77,967.

**Hannay**, James (1827–1873), Scottish man of letters. He wrote several novels, amongst which *Singleton Fontenoy* and *Eustace Conyers* are the best; also, *Lectures on Satire and Satirists*, *Studies on Thackeray*, and a *Course of English Literature*.

**Hannay**, James Owen (1865– ), Irish humorous novelist, better known under his pen-name of *George A. Birmingham*. His novels include: *Spanish Gold*, *The Red Hand of Ulster*, *The Lost Tribes*, *King Tommy*, *The Grand Duchess*, *Fidgets*, and *The Major's Candlesticks*. His plays *General John Regan* and *Send for Dr. O'Grady* were highly successful.

**Hannibal** (247–183 B.C.), Carthaginian general and statesman, son of Hamilcar (q.v.). At the age of twenty-five he received the chief command of the army, after the murder of his brother-in-law Hasdrubal. Hannibal then prepared to carry out his great designs against Rome. His siege and capture of Saguntum, a city in alliance with Rome, led to a declaration of war from the Romans. Judging that Rome could be overthrown only in Italy,



he undertook his great march on Rome across the Pyrenees, the Rhône, and the Alps. The point at which he crossed is generally believed to have been the Little St. Bernard. On the banks of the Ticino he first encountered a Roman army under Publius Scipio, and defeated it. Shortly after, another Roman army, under Sempronius, was totally routed on the Trebia. After wintering in Cisalpine Gaul, Hannibal opened next year's campaign (217) by defeating the Roman general Flaminius, whom he enticed into an ambush at Lake Trasymenus. Hannibal now marched into Apulia, spreading terror wherever he approached. Rome, in consternation, proclaimed Fabius Maximus dictator, who sagaciously resolved to hazard no more open battles, but exhaust the strength of the Carthaginians by delay. Next year (216), however, the rashness of the new consul Terentius Varro gave Hannibal the last of his great victories. The battle was fought at Cannæ, and ended in a total defeat of the Romans. Instead of marching on Rome, Hannibal now sought quarters in Capua, where luxurious living undermined the discipline and health of his troops. The campaigns of 215, 214, and 213 were comparatively unimportant. While Hannibal was seizing Tarentum (212), Capua was invested by two Roman armies. To relieve Capua Hannibal marched on Rome, and actually appeared before its gates (211), but the diversion remained fruitless, and Capua fell. In 207 a reinforcement tardily sent by the Carthaginians to Hannibal, under command of his brother Hasdrubal, was intercepted by the Romans and destroyed at the Metaurus. Hannibal now retired to Bruttium (the toe of Italy), where he still maintained the contest against overwhelming odds, till, in 203, he was recalled to defend his country, invaded by Scipio. In Africa he was defeated by the Romans at Zama (202 B.C.), and the second Punic War ended in Carthage having to accept the most humiliating conditions of peace. The Romans demanded the surrender of Hannibal, who first of all fled to the court of Antiochus of Syria, and afterwards took refuge with Prusias, King of Bithynia. He finally took poison rather than fall into the hands of the Romans.—BIBLIOGRAPHY: F. A. Dodge, *Hannibal* (Great Captains Series); W. How, *Hannibal and the Great War between Rome and Carthage*.

**Hannibal**, a town of Missouri, U.S.A., on the right bank of the Mississippi. It has tobacco factories, machine-shops, foundries, pork-packing establishments, saw- and flour-mills, and an extensive trade in lumber. Pop. 19,306.

**Hanno** (c. 500 B.C.), Carthaginian navigator. He made a voyage on the western coast of Africa for the purpose of discovery and of settling colonies. He wrote an account of his voyage, which still survives in a Greek translation known as the *Periplus of Hanno*.

**Hanoi**, capital of Tongking, and of Indo-China since 1902, on the River Song-ka, in a fruitful plain. Gold and silver filigree, lacquered wares, silks, mat- and basket-weaving are its principal industries. Although the river is navigable only for small vessels the trade of Hanoi is considerable, chiefly with the southern provinces of China. There is a school of medicine for natives. Pop. 109,500.

**Hanotaux**, Albert Auguste Gabriel (1853— ), French politician and historian. He was Minister of Foreign Affairs from 1894 to 1895, and again from 1896 to 1898. He was an ardent supporter of the Franco-Russian Alliance, which was strengthened during his tenure of office. His works include: *Henri Martin*, *Histoire de la France contemporaine*, and *Histoire de la Guerre*.

**Hanover**, formerly a kingdom in the north-west of Germany, now a province of Prussia. It is divided by intervening territories into three distinct portions, besides some small territories to the south, and a range of sandy islands lining the coast. The total area is 14,896 sq. miles. The surface in the south is covered by the Harz Mountains, but the rest of the country is a low, monotonous flat, with a gentle slope to the North Sea. The Ems, the Weser (with its tributaries the Leine and Aller), and the Elbe flow through fertile districts industriously cultivated for corn and flax. The Harz Mountains are rich in minerals, the working of which is an important industry. Ernest Augustus, a prince of the Brunswick-Lüneburg line, became in 1692 the first Elector of Hanover, married a granddaughter of James I of England, and was succeeded in 1698 by his son, George Louis, who in 1714 became George I of England. On the accession of Queen Victoria, the crown of Hanover passed

by Salic Law, to Ernest Augustus, Duke of Cumberland who was succeeded in 1851 by his son George V. In 1866, Hanover was absorbed into the dominions of Prussia. Pop. (1925), 3,190,619.

Hanover, capital of the Prussian province of Hanover, situated in an extensive plain on the Leine, which here receives the Ihme and becomes navigable. Amongst the principal buildings are the market church, the old town house, the theatre (one of the finest in Germany), the royal palace, and the Museum of Art and Science. Hanover is a manufacturing town of importance, producing machinery, iron-work, metallic goods of various kinds, chemicals, carpets, pianos, and stationery. It is first mentioned in 1163, and joined the Hanseatic League in 1481. Pop. (1925), 425,274.

Hansard, a firm of printers in London, which long printed the parliamentary debates and papers. The founder of the business was Luke Hansard (1752-1828), who, in 1800, became printer to the House of Commons. The name is still retained for the reports furnished by *The Times* staff from 1895 to 1908, and since that date by a Government staff.

Hanse Towns, certain German and other commercial cities of Northern Europe associated for the protection of commerce and united by what was called the *Hanseatic League*. In the middle of the thirteenth century the thriving ports of the Baltic and the North Sea were infested by pirates and robbers, and in 1219 a compact was made between Hamburg, Ditmarsh, and Hadeln to protect the adjacent waters. This was followed in 1241 by an alliance between Hamburg and Lübeck to keep open the road across Holstein, connecting the North Sea with the Baltic. In 1247 this league was joined by Brunswick, and out of this grew the Hansa or league, which at its most flourishing period embraced eighty-five towns, maritime and inland. Lübeck was recognized as the chief town of the League. The chief trading centres of the League were the factories of Novgorod in Russia, Bergen in Norway, Bruges, and London (the so-called Steelyard). During the latter half of the fourteenth century the power of the League was at its height. It had armies and navies, gained victories in war over the Kings of Norway and Denmark, and deposed a King of Sweden. It made

thorough provision for the security of commerce on the Baltic and North Seas, constructed canals, introduced a uniform system of weights and measures, and developed the principles of mercantile law. Most of the inland members of the confederation withdrew, however, and during the fifteenth and sixteenth centuries the cities of Hamburg, Lüneburg, and Lübeck were almost alone in their active efforts to maintain the power of the Hansa and secure for it the command of the Baltic. About the middle of the sixteenth century the Dutch became predominant in the Baltic trade. In 1597 England revoked all special privileges of the Hanseatic merchants, and in 1614 Lübeck, Stettin, Danzig, Brunswick, Lüneberg, Hamburg, Bremen, and Cologne, with a few smaller towns, were the only places that contributed to the support of the Hansa. The name still remained attached to the free cities of Lübeck, Bremen, and Hamburg, under whose protection the surviving factories continued to exist, that of Bergen being still managed in the old way till 1763. In 1813 Frankfurt-on-the-Main was included in the number of the Hanse towns. Frankfurt was incorporated in Prussia in 1866, but the three other towns are still separate constituents of Germany, with new Constitutions adopted in 1919-1921.—BIBLIOGRAPHY: W. King, *Three Free Cities*; H. Zimmern, *The Hansa Towns*.

Hansi, a town of Hissar district, Punjab, India, on the Western Jumna Canal. Pop. 14,576.

Hanumân, in Indian mythology, the name of a fabulous monkey-god, who plays a prominent part in the epic *Râmâyana*. On his account the whole tribe of monkeys, to which he is fabled to belong, is treated as sacred and allowed to multiply indefinitely.

Hanway, Jonas (1712-1786), English traveller and philanthropist. He travelled in Persia, and published *An Historical Account of the British Trade over the Caspian Sea*. He is popularly known as one of the first Englishmen who regularly used an umbrella.

Hanwell, a former urban district of Middlesex, England, now in Ealing.

Hanyang. See *Hankow*.

Hapur, a town of India, in the Meerut district, United Provinces. It has a considerable trade in sugar, grain, cotton, and timber. Pop. 19,140.

**Harakiri**, or **Seppuku**, a method of suicide permitted to offenders of the Samurai class of noblemen in Japan. It consists in cutting open the body so as to disembowel it by means of a wound made with one sword perpendicularly down the front and another with another sword horizontally. It is frequently resorted to to save dishonour or exposure. Compulsory harakiri was abolished in 1868.

**Harar**, a town of North-Eastern Africa, included in the Abyssinian territories, about 150 miles from the coast of the Gulf of Aden, now reached by a railway from the French port of Jibuti. Pop. estimated at 40,000.

**Harbin**, a town of China, in Manchuria, about 330 miles north-east of Moukden, close to the Mongolian frontier. It is the place where the Siberian railway forks, one branch going to Moukden and Port Arthur, the other to Vladivostok. It is a centre of Siberian trade. Pop. 103,400.

**Harbours**, sheltered areas of water which ships can enter and in which they can find safe accommodation even in stormy weather. Natural harbours are inlets protected by the natural configuration of the coast, and may be riverine estuaries, mouths of rivers, or simply deep coastal indentations. Artificial harbours are protected by breakwaters. Harbours are of three categories, according to their uses: (a) refuge harbours, (b) commercial harbours, and (c) fishery harbours. Class (a) are constructed on dangerous coasts where there are no natural harbours (e.g. Peterhead national harbour of refuge). Class (b) are those which form the entrances or vestibules to ports, and they may at the same time be excellent harbours of refuge. Class (c) are generally of small extent, but the entrances must be easily taken in rough weather. Such harbours are not always easy to design efficiently, and the works may be costly.—**BIBLIOGRAPHY:** W. Shield, *Harbour Construction*; B. Cunningham, *Harbour Engineering*.

**Harbour Grace**, a seaport of Newfoundland, on the west side of Conception Bay. It has a good trade, but the harbour is exposed. The exports are fish and fish-oil. Pop. 3825.

**Harburg**, a town in Prussia, in the province of Hanover, on the left bank of the South Elbe, opposite to Hamburg. It has manufactures of jute and linseed

oil, and an important trade. It can accommodate steamers drawing 27 feet. Pop. (with suburbs), 67,000.

**Harcourt**, Sir William George Granville Venables Vernon (1827–1904), British lawyer and politician. He was returned for Oxford city in 1869 in the Liberal interest; distinguished himself by his powers of satire and ridicule in debate; was made Solicitor-General in Gladstone's ministry, Nov., 1873, and Home Secretary in 1880. In 1886 he was Chancellor of the Exchequer under Gladstone, as he was under the same leader and under Lord Rosebery from 1892 to 1895, when he remodelled the death duties.

**Hardenberg**, Friedrich von (1772–1801), German writer, better known under the name of *Novalis*. He was one of the leaders of the 'Romantic School'. Amongst his works are an unfinished novel, *Heinrich von Ofterdingen*, and *Spiritual Songs*.

**Hardenberg**, Karl August, Prince von (1750–1822), Prussian statesman. In 1804 he became First Minister of Prussia. His conduct was vacillating, now favouring an alliance with Napoleon and again hostile to him. After the French disaster at Moscow he was amongst the first to declare that the time had now come for a general effort against Napoleon. Hardenberg signed the Peace of Paris, and was created prince. He was one of the most prominent actors at the Congress of Vienna.

**Hard-fern**, the popular name for *Lomaria spicant*, which is also known as *Blechnum boreale*. It is a very common British fern.

**Hardicanute** (c. 1019–1042), King of England and Denmark, son of Canute. He left the government almost entirely in the hands of his mother and the powerful Earl Godwin, while he gave himself up to feasts and carousals.

**Hardie**, James Keir (1856–1915), British politician and labour leader. In 1880 he was elected secretary of the Lanarkshire Miners' Union. He entered Parliament in 1892. Keir Hardie was one of the founders of the Independent Labour Party (I.L.P.) in 1893. His works include: *Labour Politics* (1903), *India* (1909), and *After Twenty Years: all about the Independent Labour Party* (1913).—Cf. W. Stewart, *James Keir Hardie*.

**Harding**, Warren Gamaliel (1865–

1923), twenty-ninth President of the United States. He was a member of the Ohio Senate from 1899 to 1903, Lieutenant-Governor of the state of Ohio from 1904 to 1906, and was elected to the United States Senate in 1914. Harding was elected President by a vast majority, against Cox, the Democratic candidate, on 2nd Nov., 1920. In 1921 he convened a conference of European and American statesmen at Washington for the purpose of discussing and settling the question of disarmament.

**Hardinge, Henry Hardinge, Viscount (1785-1856)**, British soldier and statesman. He became member of Parliament for Durham in 1820, was made Secretary-at-War, Secretary for Ireland, and in 1844 succeeded Lord Ellenborough as Governor-General of India. Being forced into war by an invasion of Sikhs, he took a command under Lord Gough, and, after the great battles of Mudki, Ferozeshah, and Sobraon, dictated a peace in the Sikh capital of Lahore. In 1852, on the death of Wellington, he succeeded to the post of commander-in-chief.

**Hardness**, a property of matter. Every substance can be given a definite place in a *hardness scale*. The harder of two substances will scratch the other. Mohs' scale of hardness is (1) talc, (2) gypsum, (3) calcite, (4) fluorite, (5) apatite, (6) orthoclase, (7) quartz, (8) topaz, (9) sapphire (corundum), (10) diamond. Thus H., 8.5 means, in the description of a mineral, that it is harder than topaz, but not so hard as sapphire. In a more modern method (Brinell's) a hard steel ball is forced into a flat slab of the material. The number obtained by dividing the total pressure by the curved area of the depression is the Brinell hardness number.

**Hardoi**, a town of India, administrative head-quarters of Hardoi district, Oudh, 63 miles from Lucknow. Pop. 13,855—The district has an area of 2232 sq. miles and a population of 1,121,250.

**Hardwar**, a town of India, in Saharanpur district, in the United Provinces. It is situated on the Ganges, and is one of the principal places of Hindu pilgrimage, and of the ceremonial bathing in the sacred river. Pop. 26,179.

**Hardy, Thomas (1840-1928)**, English novelist. He served an apprenticeship as an ecclesiastical architect; published his first novel, *Desperate Remedies*, in 1872,

and afterwards wrote a series of famous novels. His heart was buried in Dorchester, and his body was cremated and the ashes interred in Westminster Abbey. Among his best-known works are: *Far From the Madding Crowd*, *The Hand of Ethelberta*, *The Trumpet Major*, *The Woodlanders*, *The Return of the Native*, *The Mayor of Casterbridge*, *Tess of the D'Urbervilles*, *Jude the Obscure*, *The Pursuit of the Well-Beloved*, *The Dynasts*, *Time's Laughing-stocks*, *A Changed Man*, *Satires of Circumstance*, and *Moments of Vision*.—Cf. H. Child, *Thomas Hardy*.

**Hare, Sir John (1844-1921)**, British actor-manager. He acted for ten years with the Bancrofts, and soon made his mark, especially in the plays of T. W. Robertson. In 1890 he had a remarkable personal success in Sydney Grundy's *A Pair of Spectacles*, where he took the part of Benjamin Goldfinch. He was knighted in 1907.

**Hare, Julius Charles (1796-1855)**, English theological writer. In concert with his brother, Augustus William Hare, he published a well-known work entitled *Guesses at Truth by Two Brothers*. His other writings include several volumes of sermons and a *Memoir of John Sterling*, which provoked Carlyle into writing his *Life of John Sterling*.

**Hare**, the common name of rodent mammals of the genus *Lepus*, with long ears, long hind-limbs, a short tail, soft hair, and a divided upper lip. They run by a kind of leaping pace. The females produce litters of three to six about four times a year. The young leverets have their eyes open at birth. Among the most common are the common hare (*L. europæus*) found in Europe and Asia; the mountain hare (*L. variabilis*), confined to mountainous regions of the south and to Northern Europe, and turning white in winter; and the rabbit (q.v.). Among American varieties are the American hare (*L. americanus*), about the size of a rabbit; the polar hare (*L. arcticus*); the prairie hare (*L. campestris*), known as jack-rabbit. The hare is protected from its enemies mainly by the acuteness of its sight and hearing and its extraordinary swiftness of foot. It seldom cries except when seized or wounded.

**Harebell, or Hairbell**, the Scottish Bluebell (*Campanula rotundifolia*), a plant of the nat. ord. Campanulaceæ, common on dry and hilly pastures, by roadsides,



&c., in most districts of Europe, with a bell-shaped, blue (sometimes white) flower.

**Hareld** (*Harelda glacialis*), the long-tailed duck inhabiting the northern seas, and frequent in Orkney and Shetland, where it is known as the calloo. During the winter it ranges to the Mediterranean, Central Asia, China, Japan, and the Central United States.

**Hare-lip**, a malformation consisting in a fissure or vertical division of the upper lip, on one or both sides of the middle line of the lip, sometimes extending also to the palate. Children are frequently born with this malformation, and the cleft is occasionally double. The cure of hare-lip is performed by cutting off quite smoothly the opposite edges of the fissure, and then bringing them together and maintaining them in accurate apposition till they have firmly united.

**Harem**, or **Hareem**, is used by Mahomedans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. In Turkey and in India the women of the harem enjoy more liberty than in other Mahomedan countries. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number of concubines or female slaves, with black eunuchs, &c. The harem of the Sultan of Turkey, which consisted of slaves (generally Circassians or Georgians) was disbanded in 1923. It is, of course, only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.—**BIBLIOGRAPHY:** A. van Sommer and Zwemer, *Our Moslem Sisters*; Mrs. W. M. Ramsay, *Everyday Life in Turkey*.

**Harfleur**, a town, France, department of Seine-Inférieure, on the Lézarde near its entrance into the Seine, 6 miles east of Havre, once the chief port at the mouth of the Seine. Pop. about 3320.

**Hargreaves**, James (1720–1778), English inventor. In 1760 he invented a machine for carding, and some years after the spinning-jenny, by which he was able to spin with several spindles at once. In 1770 he obtained a patent for his invention, but it was after all declared invalid on the ground that he had sold several of the machines before taking out the patent.

**Haricot.** See *Bean*.

**Harington**, Sir John (1561–1612), English writer. He is remembered for his Rabelaisian pamphlet *The Metamorphosis of Ajaax*, and for his translation of *Orlando Furioso* in heroic verse. His *Short View of the State of Ireland* (1605) is valuable.

**Hariq**, a town of the central Arabian Emirate of Nejd and Hasa. Pop. 7000.

**Harlebeke**, a town in Belgium, in West Flanders, on the Lys. It is said to be the oldest town in Flanders. Pop. 7450.

**Harlequin.** See *Pantomime*.

**Harlequin Duck** (*Cosmonetta histriónica*), a species of Arctic duck which migrates to warmer climates in winter.

**Harley**, Robert. See *Oxford, Earl of*.

**Harlingen**, a seaport of Holland, province of Friesland, intersected by numerous canals. The harbour can accommodate vessels drawing 18 feet, and there is a great trade with England in corn, cattle, and butter. Pop. 10,574.

**Harmattan**, a hot and dry wind, which, coming from the interior of Africa, prevails at times on the coast of Guinea in December, January, and February.

**Harmonical Progression**, in algebra, a series of numbers the reciprocals of which are in arithmetical progression. The simplest A.P. is the series of natural numbers, 1, 2, 3, 4, . . . ; and the simplest H.P. the series of reciprocals of these 1,  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ , . . . (see *Harmonics*).

**Harmonic motion**, any oscillatory or reciprocating motion, but especially the type described more fully as *simple harmonic motion*. This may be defined as the motion of the projection, on a fixed diameter of a circle, of a point which moves round the circumference at constant speed.

**Harmonics**, the system of simple tones given out by a vibrating body; or those tones with the exception of the gravest, which is called the fundamental. The vibrator may be any elastic solid or fluid; but, for the production of musical sound, it is usually either a stretched string, as in the violin and piano, or an enclosed volume of air, as in the organ and other wind instruments. When a string fixed at its two ends is vibrating in its fundamental mode, there is no fixed point, or node, between the ends. In the harmonic modes certain points of the string do not move during the vibration—the mid-point in the first harmonic mode, the two points of trisection of the string in the second

mode, and so on. If the period of the fundamental be taken as 1, then the periods of the harmonics are  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ , &c. A relation of exactly this form holds for the longitudinal and for the torsional vibrations of a rod. In an organ pipe, also, the law of succession of the harmonics is practically of this type, but two cases have to be considered separately. When both ends are open, the frequencies of fundamental and overtones are, as in the case of the string, in the ratios of the natural numbers 1, 2, 3, 4, &c.; but when one end is open and the other closed, the frequencies are as the odd numbers, 1, 3, 5, &c. Well-made bells give out three prominent notes—the fundamental, the 'nominal' (an octave higher), and the 'hum-note' (an octave lower). Two simple tones only concord with one another if their frequencies are in the ratio of two small whole numbers. For an interval of an octave the frequencies are as 2:1; for a fifth, 3:2; fourth, 4:3; major third, 5:4; minor third, 6:5. In a vibrating string or organ-pipe, the lower harmonics, which are the strong ones, satisfy the condition for harmony. See *Musical Notation; Resonance; Scale; Sound; Waves*.

**Harmonium**, a musical instrument acting by the pressure of wind on a series of vibrating metallic reeds. By the action of bellows, worked by the feet, the air is made to impinge against thin tongues of metal (termed *reeds*), and to set them vibrating. These metal tongues are fitted into a slit in the top of a small box or sonorous cavity, called a wind-box, and are enabled to vibrate by being fixed only at one end. The instrument has a key-board like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind-boxes and act on the vibrator. There are several stops, by means of which the performer can direct the stream of wind into the wind-boxes which produce a flute, clarinet, or any other sound. There is also a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once.

**Harmony**. See *Musical Notation*.

**Harnack, Adolf** (1851– ), German theologian. He was the most prominent leader of a notable neo-Ritschlian movement in German theological thought, and has exercised great influence outside his

own country. His principal works are: *Martin Luther, Das Mönchtum, seine Ideale und seine Geschichte; Das apostolische Glaubensbekenntnis; Das Wesen des Christentums*; and *Essays and Addresses*.

**Harold I** (d. 930), *Haarfager* (Beautiful-haired), King of Norway. He succeeded his father in A.D. 863. He brought all the Norwegian jarls under his power, and completely subjected the country.

**Harold III** (*Hardrada*, the Hardy) (d. 1066), King of Norway. In 1047 he succeeded his nephew, Magnus the Good. In 1066 he joined Tostig, the brother of Harold II of England, in an invasion of that country, but was defeated and slain at the battle of Stamford Bridge.

**Harold I**, surnamed *Harefoot* (d. 1040), Danish King of England, succeeded his father Canute in 1035 as king of the provinces north of the Thames, and became king of all England in 1037.

**Harold II** (c. 1022–1066), King of England, the second son of Godwin, Earl of Kent. On the death of Edward the Confessor, 5th Jan., 1066, he stepped without opposition into the vacant throne. Immediately after routing his brother Tostig and Harold III of Norway at Stamford Bridge he heard of the landing of the Duke of Normandy at Pevensey, in Sussex, and hastened thither with all the troops he could muster. A general engagement ensued at Senlac, near Hastings, 14th Oct., 1066, in which Harold was slain, and the crown of England passed to William.

**Haroun al Raschid**. See *Harun al Rashid*.

**Harp**, a stringed instrument of great antiquity, found among the Assyrians, Egyptians, Hebrews, Greeks, Irish, Welsh, and other nations. Its variety of form and construction was only equalled by its universality. The modern instrument is well known; its form is nearly triangular, and the strings are distended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. In 1810 Sebastian Eard patented a double-action harp with seven pedals, each effecting two changes in the pitch of the strings. The harp thus constructed contains forty-three strings tuned according to the diatonic scale, every eighth string being a replicate in another octave of the one counted from.—Cf. W. H. Grattan-Flood, *The Story of the Harp*.

**Harpenden**, an urban district of England, Herts, 5 miles south-east of Luton, the seat of laboratories, experimental fields, &c., established by Sir John Bennet Lawes for the furtherance of agriculture, and ultimately made over for public use. Pop. (1931), 8349.

**Harper's Ferry**, a village of the U.S.A. in West Virginia, on the Potomac, the scene of the unsuccessful rising (1859) headed by John Brown (q.v.) with a view to destroying slavery.

**Harpies**, the Greek goddesses of storms. In the Homeric poems they are ministers of untimely death, 'snatchers', and personifications of the angry winds. The later poets and artists depicted them as having human faces, crooked talons, and wings, and as covered with filth and polluting everything in contact with them.

**Harpisichord**. See *Pianoforte*.

**Harpy-eagle** (*Thrasaëtus harpyia*), a diurnal bird of prey which inhabits tropical America. It is extremely powerful.

**Harrier**, the name of several hawks of the genus *Circus*, allied to the buzzards. They strike their prey upon the ground and generally fly very low. The marsh-harrier, the hen-harrier, and Montagu's harrier are found in Great Britain.

**Harrington**, James (1611-1677), English political writer. During the Protectorate he wrote his *Oceana*, which describes an ideal republic, and which was published in 1656.

**Harris**, the southern part of the Island of Lewis, Outer Hebrides, Scotland. The parish, which includes St. Kilda, is mountainous and barren. Sheep-rearing, the making of Harris tweed, and fishing are the chief industries. Pop. (1931), 4467.

**Harrisburg**, a city of the U.S.A., capital of Pennsylvania, 110 miles north of Washington, on the Susquehanna. It has important industries connected with iron and steel, various other industries, and an active trade. Pop. 75,917.

**Harrismith**, a town in the Orange Free State, South Africa, situated amongst the mountains 60 miles from Ladysmith. It is an important trading centre, has a large woollen factory, and is a favourite health resort. Pop. 6200 (2546 white).

**Harrison**, Frederic (1831-1923), English writer on philosophical and miscellaneous subjects. He was the chief representative in England of positivism and the religion of humanity. His writings

include: *The Meaning of History*; *The Choice of Books*; *Studies in Early Victorian Literature*; *William the Silent*; *Tennyson, Ruskin, and Mill*; *The Creed of a Layman*; *The Positive Evolution of Religion*; *Obiter Scripta*; and *Novissima Verba*.

**Harrison**, John (1693-1776), English horologist and inventor. An Act of Parliament had been passed in 1714 offering rewards of £10,000, £15,000, or £20,000 for a method of ascertaining longitude within 60, 40, or 30 miles. Harrison succeeded in solving the problem by the invention of the chronometer in 1735.

**Harrogate**, a borough of England, county of York, noted for its springs especially recommended for patients with deranged digestive organs, chronic gout, and some cutaneous diseases. The bathing season lasts from May to September. Pop. (1931), 39,785.

**Harrow**, a town of England, county of Middlesex, on a hill of peculiar form. The grammar-school of Harrow, the rival of Eton, was founded by John Lyon, in 1571, for the education of the poor children of the parish, but is now almost entirely a school for the wealthy. The school numbers about 600 boys, and there are eleven houses. Pop. (1931), 26,378.

**Harry** (or **Henry**) **the Minstrel**, commonly called *Blind Harry* (fifteenth century), Scottish poet. He wrote a poetical narrative of the achievements of Sir William Wallace, of which there is a complete manuscript of date 1488 in the National Library of Scotland. The date of the poem may probably be placed between 1470 and 1480. It professes to be based on Latin histories by John Blair and Thomas Gray, otherwise unknown. It has little or no value as history, and contains impossible incidents, yet recent discoveries have vindicated its accuracy in several particulars once discredited.—Cf. J. Moir, *A Critical Study of Blind Harry*.

**Hart**, Sir Robert (1835-1911), Anglo-Chinese statesman. He entered the British consular service in China in 1854, and in 1859 he accepted an appointment in the Chinese Imperial Maritime Customs, of which he became inspector-general in 1863. He discharged the important and responsible duties of this post with conspicuous ability during a critical period, retiring in 1908. He wrote *These from the Land of Sinim* (1901).

Harte, Francis Bret (1839–1902), American author. He joined the staff of *The Californian*, to which he contributed the humorous burlesques afterwards published as *Sensation Novels Condensed* (1870). In 1868 he became editor of *The Overland Monthly*, in which appeared *The Luck of Roaring Camp* (1868), *The Outcasts of Poker Flat* (1869), two of his best short stories, and *The Idyl of Red Gulch*, also the humorous poem of *The Heathen Chinee*. His short stories, mostly dealing with the rough western life of former days, include: *The Twins of Table Mountain* (1879), *Flip* (1882), *A Drift from Redwood Camp* (1888), *From Sand Hill to Pine* (1900). He was less successful in his novels. He also wrote much verse.

Hartebeest, or Caama (*Alcelaphus or Bubalis caama*), a South African antelope measuring about 5 feet. They are generally found in small herds.

Hartford, a city of the U.S.A., capital of Connecticut, on the Connecticut River, 50 miles above its mouth. Both manufactures and trade are of large extent, the former embracing bicycles, steam-engines, small-arms, and foundry and machine-shop products. It is a great centre of the insurance business. Pop. 138,036.

Hartlepool, a borough of England, including the municipal borough of Hartlepool and the county borough of West Hartlepool, in the county of Durham. The trade and industries of the towns are much of the same character; they possess ironworks, puddling furnaces, brass-foundries, engine- and boiler-works, shipyards, sawmills, and breweries. Extensive fisheries are also carried on, and there is a special covered fish quay. The two towns may be said to form one port, with accommodation, dry-docks, and all repair and cargo facilities for the largest vessels. Pop. (1931) of Hartlepool, 20,545; of West Hartlepool, 68,134.

Hartley, David (1705–1757), English metaphysician. In his *Observations on Man* (1749, 2 vols.) he formulated his hypothesis of nervous vibration and of the association of ideas.

Hartley, a township in Rhodesia, 60 miles south-west of Salisbury. It is the centre of an important gold-mining area. White pop. 1862.

Hart's - tongue (*Scolopendrium*), a genus of ferns. Their fronds are simple and undivided. There are about a dozen

species known, the *S. vulgare* being British.

Harun al Rashid (763–809), Caliph of Baghdad. The popular fame of this caliph is evinced by the *Arabian Nights' Entertainments*, in which Harun, his wife Zobeide, his vizier Gaffar, and his chief eunuch Mesrur are conspicuous characters.

Harvard University, the oldest university in the U.S.A., situated in Cambridge, Massachusetts. The nucleus of it was formed in 1636 by the voting of a sum of £400 by the general court of Massachusetts. In 1638 the Rev. John Harvard bequeathed half of his property and his entire library to the projected institution. The college was immediately opened, and received the name of its benefactor, and the first graduation occurred in 1642. The principal college buildings number twenty-five, and include several halls, such as University Hall, Harvard Hall, &c. The libraries contain over two million volumes. There are about 782 members of the teaching staff, and the number of students is over 7000.—Cf. W. R. Thayer, *History and Customs of Harvard University*.

Harvest-bug (*Trombidium*), the tiny six-legged larvæ of certain mites, of a bright red colour, appearing in summer. They attack animals and human beings by burrowing under the skin.

Harvest-moon, the name given to the full moon nearest to the autumnal equinox (23rd Sept. in northern latitudes). For some days before and after her full the moon then rises nearly at the same hour on successive evenings. The cause of the phenomenon is that this full moon is near the First Point of Aries, and travelling north. Her northward motion in declination nearly or quite counterbalances, in higher latitudes, the daily retardation which would else result from her eastward motion in right ascension.

Harvest-mouse (*Mus messorius*), a tiny British mammal, about 2½ inches long, first mentioned by White of Selborne.

Harvey, Sir John Martin (1867– ), British actor-manager. He began his career with Clayton and Wyndham, but subsequently joined Sir Henry Irving, and remained many years with him. He has managed the Lyceum, Prince of Wales's, the Court, the Royalty, and the Apollo Theatres. Among his productions are:



*The Only Way, The Breed of the Treshams, The Corsican Brothers, and Armageddon.*

Harvey, William (1578–1657), English physician. His views on the circulation of the blood were formally given to the world in his *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (On the Movement of the Heart and Blood in Animals), published at Amsterdam in 1628, in which he claims to have expounded and demonstrated them for upwards of nine years. In 1623 he was appointed physician extraordinary to James I, and in 1632 he became physician in ordinary to Charles I. Of Harvey's works, the next in importance to the *De Motu* is his *Exercitationes de Generatione Animalium* (On the Generation of Animals; 1651).— Cf. R. Willis, *Life of Harvey*.

Harwich, a borough and seaport of England, Essex. The harbour, formed by the estuaries of the Orwell and the Stour, can accommodate vessels drawing 25 feet. Steam packets ply regularly to Continental ports. Shipbuilding and other maritime employments are carried on, and cement is manufactured. Pop. (1931), 12,700.

Harwood, Great, a town of England, Lancashire,  $4\frac{1}{2}$  miles north-east of Blackburn, with cotton manufactures, coal-mines, &c. Pop. 13,596.

Harz, the most northerly mountain chain of Germany, from which an extensive plain stretches to the North Sea and the Baltic. It extends from south-east to north-west, and comprises an extent of about 60 miles in length. The Brocken, its highest summit, is 3742 feet high. The Harz abounds in woods and fine pastures, and is rich in minerals.

Hasdrubal (d. 207 B.C.), Carthaginian general, brother of Hannibal (q.v.). On the departure of Hannibal for Italy, 218 B.C., he was left in command of the army in Spain, in which capacity he carried on a long series of military operations against the Roman troops. His brother Hannibal requiring his assistance in Italy, Hasdrubal led an army from Spain into that country (207 B.C.), but before he could join forces with his brother he was defeated and killed on the right bank of the Metaurus.

Hashish, a preparation made in Eastern countries from common hemp (*Cannabis sativa*), or rather from the Indian variety of it (*Cannabis indica*). Hashish produces a kind of intoxication, accompanied with ecstasies and hallucinations. When dried

and smoked as tobacco, the plant is called *bhang*; or this name is given to a drink prepared from the leaves and shoots. *Ganja* or *Ganja* is the dried shoots of the female plant with the resin on them.

Haslingden, a borough, England, Lancashire, 16 miles north of Manchester, with manufactures of cottons and woollens; coal-mines, quarries, &c. Pop. (1931), 16,637.

Haspe, a town, Germany, on the Westphalian coal-field. It has industries connected with iron, steel, and brass. Pop. 23,500.

Hassan, a district and town of India, in Mysore. Coffee and cereals are exported, and felspar and kaolin are found. Area, of district, 2666 sq. miles; pop. 580,200. Pop. of town, 8000.

Hasselt, a town, Belgium, capital of Limburg, on the Demer, with manufactures of tobacco, lace, linen; distilleries, &c. Pop. 17,000.

Hastings, Francis Rawdon, Marquess of (1754–1826), British soldier and statesman. From 1813 to 1823 he was Governor-General of India, and was successful in the Nepaulese and Mahratta Wars. In his latter years he was Governor of Malta.

Hastings, James (1855–1922), Scottish Biblical scholar. He edited *The Expository Times*, which he founded in 1889, but he is better known as editor of a *Dictionary of the Bible* (5 vols.), a *Dictionary of Christ and the Gospels*, a *Dictionary of the Bible* (1 vol.), and the *Encyclopædia of Religion and Ethics*.

Hastings, Warren (1732–1818), English statesman and first Governor-General of India. In 1750 he set out for Bengal in the capacity of a writer in the service of the East India Company. He was representative of the Company at Moorshedabad from 1758 to 1761. In the latter year he removed to Calcutta, having obtained a seat in the Bengal Council. After a sojourn in England (1764–1769), he returned to India and was the chief instrument of the Company in its endeavours to get Bengal more directly under its control. In 1772 he became president of the Supreme Council of Calcutta. In 1773 the Company's powers were considerably modified by an Act of Parliament, and Hastings received the title of Governor-General of India. In 1776 the directors of the Company petitioned Government for his removal from the Council, but Hastings

resigned, and a successor to him was appointed. In 1777 one of the members of the Council died, and Hastings, having thus procured a casting vote, withdrew his resignation, and returned to office. He now displayed extraordinary resource in meeting dangerous movements on the part of the Mahrattas, the Nizam of the Deccan, and Hyder Ali of Mysore, and to procure the needful money was less than scrupulous in his treatment of the rulers of Benares and Oudh. He thus gave good grounds for censure, and a motion for his recall was passed in the House of Commons. Fox's India Bill was thrown out in 1783, but next year Pitt's Bill establishing the board of control, passed, and Hastings resigned. He left India in 1785, and was impeached by Burke in 1786, being charged with acts of injustice and oppression, with maladministration, receiving of bribes, &c. This celebrated trial, in which Burke, Fox, and Sheridan thundered against him, began in 1788, and terminated in 1795 with his acquittal, but cost him his fortune.—**BIBLIOGRAPHY:** Lord Macaulay, *Essay on Warren Hastings*; L. J. Trotter, *Warren Hastings*; Sir A. Lyall, *Warren Hastings*.

**Hastings**, a borough and market town of England, county of Sussex, one of the Cinque Ports, situated on the sea-coast, and including the suburb of St. Leonards-on-Sea. Fishing and boat-building are carried on, but the principal support of the town is derived from the numerous visitors who frequent it during the bathing and winter seasons. There are here the ruins of an ancient castle. William of Normandy defeated Harold near here in 1066. Pop. (1931), 65,199.

**Hastings**, a town, New Zealand, North Island, with refrigeration and fruit-canning factories. Pop. (1927), 15,050.

**Hat**, an outdoor covering for the head of various shapes and materials (as felt, silk, wool, straw), but having a *brim* as its most distinctive and general feature. Hats are of ancient origin. The shape of the hat has varied extremely in Europe at different periods. The first modern hat, as we now know this article, was made in Paris at the beginning of the fifteenth century, but it was adopted only half a century later by the French. The silk hat was invented at Florence about 1760. The manufacture, however, did not make much progress till 1828. In the manufacture of straw hats the straw

commonly used is that of wheat or barley. The best come from Italy, and particularly from Tuscany, but straw hats are also largely made in England. Palm-leaf hats are imported from China and elsewhere, and are also machine-made in the United States. Felt hats are made of fur, wool, or a mixture of the two.

**Hatfield**, or **Bishop's Hatfield**, a town of England, in the county of Hertford. Pop. (1931), 10,999 (rural district).

**Hathras**, a town of India, United Provinces, Aligarh district, formerly one of the strongest fortresses in India, now a great commercial centre. Pop. 37,854.

**Hatien**, a town of Cochinchina, 150 miles w.s.w. of Saigon. Pop. 11,000.

**Hatteras**, a headland at the entrance to Pamlico Sound, North Carolina, U.S.A. It is dangerous to navigation.

**Hatto** (d. 970), Archbishop of Mainz. The legend of his being devoured by rats (the fable of the 'Mäusethurm'), popularized by Southey, is well known.—Cf. S. Baring-Gould, *Curious Myths of the Middle Ages*.

**Hatton**, Sir Christopher (1540-1591), English statesman. He entered Parliament in 1571, became captain of the queen's guard in 1572, Vice-Chamberlain and a Privy Councillor in 1577, and Lord Chancellor in 1587.

**Haugesund**, a seaport of Norway, on the west coast, about 65 miles south of Bergen. It can accommodate large vessels drawing up to 30 feet, and is ice-free all year. Its principal export is fish. Pop. 16,565.

**Hauptmann**, Gerhart (1862- ), German dramatist. His plays include: *Vor Sonnenanfang* (1889), *Das Friedensfest* (1890), *Einsame Menschen* (1891), *Die Weber* (1892), *Kollege Crampton* (1892), *Der Biberpelz* (1893), *Hanneles Himmel-fahrt* (1894), *Fuhrmann Henschel* (1898), and *Griselda* (1909). Hauptmann received the Nobel prize for literature in 1912.—Cf. K. Holl, *Gerhart Hauptmann: his Life and his Work*.

**Hauran**, a district of Syria in the territory of Damascus, east of the Jordan and south of Damascus. It is very fertile, producing much wheat, but is thinly populated. The inhabitants are mainly Druses. See *Syria*.

**Hausa**, a negroid African people in the Sudan. The country of the Hausas includes Northern Nigeria, is very fertile, and is

well cultivated. The Hausa language is the general medium of commercial intercourse in Central Africa. The people are Mahommedans.

Hauser, Kaspar (c. 1812-1833), German impostor. He appeared mysteriously in the streets of Nürnberg in 1828, and was obviously an epileptic, who would be no loss to his family. The romantically-minded persuaded themselves that he was the Crown Prince of Baden, who had been kidnapped in infancy. His death was as mysterious as his life; but it is probable that he was an unintentional suicide. He probably wounded himself to secure commiseration, and his dagger penetrated more deeply than he intended.—Cf. Andrew Lang, *Historical Mysteries*.

Hauta, a town in the Central Arabian emirate of Nejd and Hasa. Pop. 10,000.

Haute-Vienne. See *Vienne, Haute*.

Haüy, René Just (1743-1822), French mineralogist. He introduced a once celebrated system of crystallography. In 1802 Napoleon made him professor of mineralogy in the Musée d'Histoire Naturelle, and also shortly after in the Faculté des Sciences. His principal writings are his *Essai sur la théorie et la structure des cristaux* (1784), his *Traité de minéralogie* (1802), his *Traité élémentaire de physique* (1803), and his *Traité de cristallographie* (1817).

Havana, a city, capital of Cuba, on the north-west side of the island, with an extensive natural harbour accommodating vessels drawing up to 30 feet. There is a university and a cathedral. The staple manufacture is that of its celebrated cigars. The other manufactures, consisting chiefly of chocolate, straw hats, and woollen fabrics, are not of much consequence. The trade is extensive, the most important articles of export being sugar and tobacco (unmanufactured or in the form of cigars and cigarettes), molasses, coffee, wax, honey, and rum. Several railways start from Havana. Pop. 363,506.

Havel, a navigable river of Germany, with extensive canal connexions, rises in Mecklenberg-Schwerin, receives the Spree, and joins the Elbe after a course of 160 miles.

Havelock, Sir Henry (1795-1857), British soldier. He took part in the Afghanistan War, was present at the storming of Ghazni and the capture of Kabul, and in Sale's march to Jelalabad, and assisted in the defence of that city, and in the

defeat of Mohammed Akbar, 1843. He distinguished himself in the Sikh War of 1845, being present at Mudki, Ferozeshah, and Soobraon. On the outbreak of the Indian Mutiny he defeated the rebels at Fattihpur, Aong, Pandunadi, and Maharajpur. On arriving at Cawnpore he found that Nana Sahib had massacred the prisoners. Pursuing his march to Lucknow he defeated the rebels at Bithoor, and finally, with the aid of Outram, won the battle of Alumbagh. Having captured Lucknow, Havelock and Outram were shut up there until relieved by Sir Colin Campbell, 17th Nov., 1857. A week later he died of dysentery.

Haverfordwest, a municipal borough and county of a town of Wales, county town of Pembroke, on the West Cleddaw River. It manufactures paper, and has a small shipping trade. Pop. (1931), 6113.

Haverhill, a market town of England, in Suffolk, with manufactures of horse-hair cloth, silk, &c. Pop. (1931), 3827.

Haverhill, a town of the U.S.A., in Massachusetts, on the Merrimac, with extensive manufactures of boots and shoes. Pop. 53,884.

Havre, Le, a seaport of Northern France, department of Seine-Inférieure, on the north side of the estuary of the Seine. It has a splendid harbour with all facilities for loading, dry-docking, and repairing vessels up to 24,000 tons. The town has a number of industrial establishments, sugar-refineries, breweries, and shipbuilding-yards, but the chief dependence of Havre is on its commerce, which is the greatest of any French port next to Marseille. It has a large trade with Britain, Germany, and America. The importance of Havre dates from the early part of the sixteenth century. Pop. (1926), 158,022.

Hawaii, or the Sandwich Islands, a North Pacific archipelago; area, 6449 sq. miles; pop. 284,538 (including 22,000 pure and 20,000 half-bred Hawaiians and 120,000 Japanese). There are eight inhabited islands, the largest being Hawaii (4015 sq. miles), Maui (728 sq. miles), and Oahu (598 sq. miles). The group formed an independent kingdom till 1893, when the queen was deposed and a republic was set up. In 1898 the Hawaiians asked to be annexed by the United States of America, and in 1900 Hawaii was constituted a self-governing American territory. The climate of the islands is ideal,

there are good roads and railways in the principal islands, and Hawaii is a favourite tourist resort. On the Island of Hawaii is Kilauea, the greatest active volcano in the world. The chief agricultural products are sugar, pineapples (which are world famous), fruit of all kinds, rice, tobacco, and coffee. Honolulu is the capital, and is a port of call for steamers of many lines. Other towns are Hilo, Wailuku, Kahului, Lihue, and Waimea.

**Hawarden**, a town in Flintshire, Wales, lying in a coal district, and having valuable clay beds in the vicinity. Pop. (rural district), 26,570.

**Hawes**, Stephen (c. 1474–1523), English poet. His principal work is *The Historie of Graunde Amour and la Bell Pucell or The Pastime of Pleasure*.

**Hawfinch** (*Coccothraustes vulgaris*), one of the largest of the finches found in Britain.



Hawfinch (*Coccothraustes vulgaris*)

It is coloured like the chaffinch but is bigger, has a larger beak, and a different wing formation.

**Hawick**, a burgh of Scotland, in Roxburghshire, on the Teviot. The staple industries of the town are the manufacture of hosiery and tweeds, but tanning, skin-dressing, oil-making, dyeing, and iron-founding are also carried on. Pop. (1931), 17,059.

**Hawk**, a name often applied to falcons, buzzards, harriers, and kites, as well as the hawks proper. Of the hawks proper the chief British species are the goshawk and the sparrow-hawk (q.v.).

**Hawke**, Edward Hawke, Lord (1705–1781), British admiral. Entering the navy as a midshipman, he received the command of the *Wolf* in 1734, and in 1747 he became commander of a squadron, and defeated the French fleet at Belleisle. In 1759 he defeated the French at Quiberon, and in 1763 was appointed Vice-Admiral of Britain.

**Hawke's Bay**, a district of New Zealand, on the east coast of North Island; area, 4240 sq. miles, containing much fertile soil, well adapted to agricultural and pastoral purposes, and a considerable amount of forest land. The capital is Napier. Pop. (1926), 67,653.

**Hawkesbury**, a town of Ontario, Canada, between Montreal and Ottawa. It has a lumber-mill and pulp- and paper-mills, including the largest sulphite-paper mill in the British Empire. Pop. 5544.

**Hawkesbury**, a river of New South Wales, Australia, 300 miles long. It falls into Broken Bay, 25 miles N.N.E. of Sydney.

**Hawkins**, Sir John (1532–1595), British admiral. He became Treasurer of the Navy in 1573, and in 1588 was appointed vice-admiral in the expedition against the Armada. In 1590 he and Frobisher unsuccessfully attempted to intercept the Spanish plate fleet, and in 1595 he and Drake led an unsuccessful expedition against the Spaniards in the West Indies, in the midst of which Hawkins died.

**Hawk-moth**, one of the sphinx moths, well-known species of which are death's-head hawk-moth (*Acherontia atropos*), privet hawk-moth (*Sphinx ligustri*), and humming-bird hawk-moth (*Macroglossa stellatarum*).

**Hawkweed** (Hieracium), a genus of composite plants, sub-order Cichoraceæ, consisting of numerous species with yellow flowers, common weeds in Britain and other parts of Europe.

**Hawkwood**, Sir John (d. 1394), English condottiere. In 1360 he occupied a prominent place in the marauding companies which harassed France. He next took regular service under the Pisan Republic for twenty-three years, but in 1387 he entered that of the Florentines. He founded the English hospital at Rome, and died at Florence.

**Haworth**, a town in the West Riding of Yorkshire, 8 miles north-west of Bradford, intimately connected with the Brontë family. Pop. (1931), 5912.



Hawthorn, an important residential suburb of Melbourne, Australia. Pop. 27,795.

Hawthorn, or Whitethorn (*Crataegus oxyacantha*), a small spiny European tree, belonging to the sub-order Pomæ of the order Rosaceæ, rising sometimes to the height of 20 to 25 feet. There are about fifty species, some of which are American. When young it grows quickly, but later it makes wood very slowly. The timber is hard and durable. The flower is often called *May*.

Hawthorne, Nathaniel (1804-1864), American author. In 1837 appeared his *Twice-told Tales*, a collection of stories which he had contributed to various American periodicals. In 1846 he published his *Mosses from an Old Manse*, in 1850 *The Scarlet Letter*, in 1851 *The House of the Seven Gables*, and in 1852 *The Life of Franklin Pierce*, and *The Blithedale Romance*. Other works are his *Transformation* (1860), and *Our Old Home* (1863).—Cf. Henry James, *Hawthorne* (English Men of Letters Series).

Hay, a river of Canada rising in Alberta and falling into Great Slave Lake. Its total course is 352 miles.

Hayashi, Count Tadasu (1850-1913), Japanese diplomatist. In 1900 he became Japanese Ambassador in London. During his tenure of office treaties were concluded between Japan and Great Britain (in 1902 and 1905). He returned to Japan in 1905, and was Foreign Minister from 1906 to 1908, and Minister of Commerce from 1911 to 1913.

Haydn, Franz Joseph (1732-1809), Austrian musical composer. From 1761 to 1790 he was musical director to Prince Esterhazy, and composed during this period a great number of works, including some 120 symphonies for the orchestra, 12 operas, &c. In 1791 and 1794 he visited England, staying there nearly three years altogether, and writing his opera *Orpheus and Eurydice*. In 1798 he published his oratorio of *The Creation*, and in 1800 that of *The Seasons*. Haydn's principal merit consists in his opening up a new development of instrumental composition, of which his 125 orchestral symphonies furnish abundant proof. He may be said to have been the originator of the symphony and of the stringed quartette.—BIBLIOGRAPHY: P. D. Townsend, *Joseph Haydn*; J. C. Hadden, *Joseph Haydn*.

Haydock, a town of south-west Lancashire, 3 miles north-east of St. Helens, with large collieries. Pop. (1931), 10,352.

Haydon, Benjamin Robert (1786-1846), English historical painter. Of his pictures the principal are: *Christ's Entry into Jerusalem*, *The Raising of Lazarus*, *The Mock Election*, *Chairing the Member*, *Pharaoh Dismissing Moses*, *The Burning of Rome*, *The Banishment of Aristides*, and *Quintus Curtius Leaping into the Gulf*. He left an interesting autobiography.

Hayes and Harlington, an urban district of Middlesex, England. It has manufactures of gramophones, pianos, and aeroplanes. Pop. (1931), 23,646.

Hay-fever, Hay-asthma, or Summer Catarrh is a disease affecting the upper air-passages, often associated with asthmatic attacks, and due to the action of the pollen of certain grasses and plants. There is severe itching of the eyes, and sneezing-bouts of from twenty to fifty sneezes are not uncommon. Treatment consists of tonics for the nervous system, change to mountain air, local treatment of the nose, and antitoxin treatment; the particular infecting pollen should be discovered and the equivalent antitoxin used.

Hayling, an island in Hampshire, England, at the entrance to Chichester harbour. It is 10 sq. miles in extent, and is a favourite holiday resort.

Haynau, Julius Jakob (1786-1853), Austrian general. In 1848 and 1849 he rendered valuable services to Austria against the Italians, took Brescia by storm, and visited it with unrelenting severity. He was afterwards highly successful in his operations against the Hungarian revolutionaries.

Hazara, a district of India, in the North-West Frontier Province. There are extensive forests, wheat and barley are grown, and coal, iron, and gypsum are mined. Area, 3062 sq. miles.

Hazaribagh, chief town of the district of the same name, in Chota Nagpur, Bengal, the centre of an important coal-mining area. Pop. 16,700. The district contains 7021 sq. miles. Pop. 1,164,321.

Hazebrouck, a town of France, department of Nord. It has linen manufactures, breweries, tanneries, dyeworks, &c. Pop. 12,566.

Hazel (*Corylus*), a genus of shrubs or small trees of the order Corylaceæ or Cupulifera. The European hazel (*C.*

*Avellana*) produces the nuts called filberts, and grows best in a tolerably dry soil. It bears male and female flowers, the former composing cylindrical catkins. The American hazel (*C. americana*) very much resembles the European.—The *witch* (or *wych*) hazel, *Hamamelis virginica*, is a shrub or small tree of a different natural order, the Hamamelidaceæ. It is a native of the United States.

**Hazel Grove**, with Bramhall, an urban district of England, Cheshire, 2 miles s.s.e. of Stockport, with similar industries. Pop. 10,125.

**Hazleton**, a city of Pennsylvania, U.S.A., a popular holiday resort. It is the centre of an important anthracite region, and has iron-works, knitting- and lumber-mills. Pop. 27,000.

**Hazlitt**, William (1778–1830), British essayist and critic. He was educated with a view to becoming a Unitarian minister. He abandoned this idea, and in 1802 decided to become a portrait-painter. He was not successful in this career. He became friendly with Lamb and Coleridge, however, and they increased his natural inclination towards literature as a profession. His chief works are: *An Essay on the Principles of Human Action* (1805), *A Reply to Malthus* (1806), *View of the English Stage* (1818), *Lectures on the English Comic Writers* (1819), *Characters of Shakespeare's Plays* (1817), *The Spirit of the Age* (1825), and *the Life of Napoleon Buonaparte* (1828–1830). Hazlitt was a great essayist, and possessed a beautiful and lucid style. As a critic of Shakespeare he stands extremely high. He had not Coleridge's flashes of inspiration, but he is far more reliable than Coleridge. He is nearly always sound and sensible. His lectures on the English Comic Writers are less good; in many cases he seems to have got up his subject for the occasion and not to have meditated upon it sufficiently. *The Spirit of the Age* is one of Hazlitt's best books. It is written with great animation, and is in a beautiful style. Hazlitt's *Life of Napoleon* was a very large piece of work intended to be a counterblast to Scott's biography, by one who claimed to be a Liberal. In his literary tastes Hazlitt was a confirmed Tory. He liked the old writers—Shakespeare, Milton, and Fielding were among his favourites—and he only admitted Scott grudgingly to a place in his affections. He read little

after he was thirty, and was always unwilling to break new ground.—BIBLIOGRAPHY: P. P. Howe, *The Life of Hazlitt*; A. Birrell, *William Hazlitt* (English Men of Letters Series).

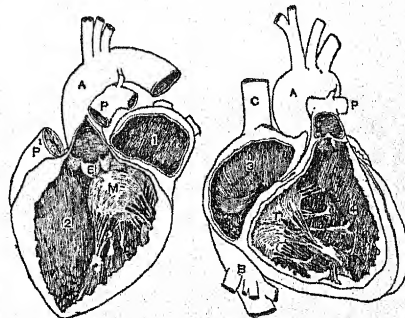
**Head.** See *Skull*.

**Healy**, Timothy Michael (1855–1931), Irish politician. He was called to the Irish Bar in 1884, and the English Bar in 1903, and was long a prominent Nationalist member of Parliament. He became the first Governor-General of the Irish Free State in 1922, resigning in 1928.

**Heanor**, a town of England, Derbyshire, 3 miles north-west of Ilkeston, with ironworks, hosiery manufactures, and collieries. Pop. (1931), 22,386.

**Hearne**, Thomas (1678–1735), English antiquary. Among his works may be mentioned: *Ductor Historicus*, *Reliquiæ Bodleianæ*, *History and Antiquities of Glastonbury*, editions of Leland, of Spelman's *Life of Alfred*, and of Fordun's *Scotichronicon*.

**Heart**, a hollow muscular organ, the function of which is to maintain the

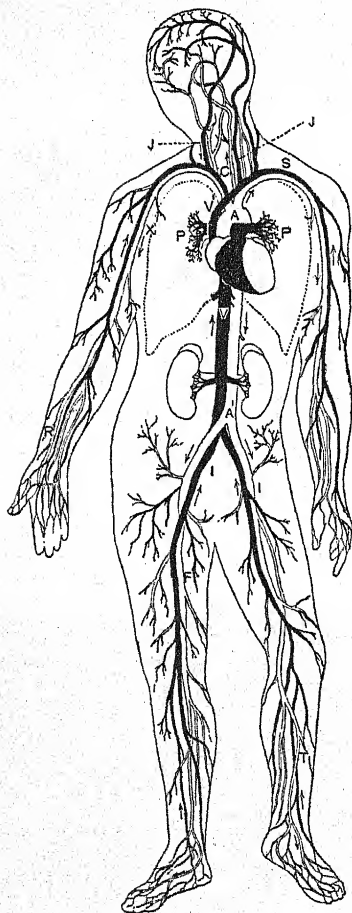


Sections of Human Heart

1, Left auricle with the two pulmonary veins. 2, Left ventricle. 3, Right auricle. 4, Right ventricle. A, Aorta. B, Inferior vena cava. C, Superior vena cava. P, Pulmonary artery (semilunar valve at P). E, Semilunar valve at commencement of aorta. M, Mitral valve. T, Tricuspid valve.

circulation of the blood, the organs of circulation being the heart, the arteries, the veins, and the capillary vessels. The heart is composed of four cavities, two *auricles* and two *ventricles*. It is enveloped in a membrane called the *pericardium*, a fibro-serous sac, consisting of two layers—an outer, or *fibrous*, and an inner, or

*serous*. The right auricle is the chamber that receives the blood returned from the



The Circulatory System shown diagrammatically  
Veins in black; arteries in double lines.

A, Aorta proceeding from the left ventricle, branch into at A<sup>1</sup> into the two iliac arteries I.

V<sub>1</sub> and V<sub>2</sub>, Superior and inferior vena cava, both carrying impure blood into the right auricle. J, J, Jugular veins. C is placed between the two carotid arteries. P, P, Pulmonary arteries. S, Subclavian, X, Axillary, R, Radial, F, Femoral, and T, Tibial veins and arteries.

body by the *vena cava superior* (from the head, arms, and chest), and the *vena cava*

*inferior* (from the legs and abdomen), and from the substance of the heart itself by the *coronary vein* (or *sinus*). The blood is then passed into the right ventricle. The communication between this auricle and ventricle is closed by a valve when the ventricle contracts. The right ventricle communicates with the pulmonary artery which transmits the blood to the two lungs to be oxygenated and to get rid of its superfluous carbonic acid gas. The blood is brought from the lungs by the pulmonary veins and poured into the left auricle. The left auricle communicates through a valved opening with the left ventricle. The left ventricle distributes the oxygenated blood to the body by means of the aorta, also provided with a valve similar to that of the pulmonary artery. The auricles and ventricle of one side are separated from those of the other by a complete muscular partition, the *septum cordis*. The heart is formed of a firm thick muscular tissue, composed of interlacing fibres. The aorta gives off branches that carry the blood from the heart to all parts of the body. These arteries terminate in the capillary vessels, a series of extremely minute tubes which pass over into the veins. The veins are the channels by which the blood is brought back from the body to the right auricle of the heart. The blood which is returned from the veins is bluish in colour from excess of carbonic acid gas and deficiency in oxygen, and is called *venous*; that which leaves the left ventricle is bright red, being oxygenated, and is called *arterial*. The venous blood parts with its excess of carbonic acid and receives new supplies of oxygen in the capillary system of the lungs, flows into the pulmonary veins, thence into the left cavities of the heart, thence it passes into the aorta, and is transmitted to all parts of the body, returning to the veins by the capillary system. It is now become venous, passes through the veins from the extremities towards the heart, receiving the chyle and the lymph, and is emptied into the right cavities of that organ, which returns it through the pulmonary artery to the capillary vessels of the lungs, where it is subjected to the influence of the air, resumes the qualities of red or arterial blood, and is ready for a new course.

The mechanism of the circulation is

similar in action to that of a pump. The two auricles contract and relax simultaneously with each other, as do also the two ventricles. The relaxation is called *diastole*; the contraction *systole*. The quantity of blood projected at each systole is generally estimated at 6 ounces. Among diseases of the heart are: *pericarditis*, inflammation of the pericardium; *endocarditis*, inflammation of the inner lining; and *valvular disease*, often the sequel of rheumatic fever. In *fatty degeneration* the muscular fibres are replaced by oleaginous particles. Two common heart troubles are *angina pectoris* (q.v.) and *palpitation*, which may be a symptom of organic disease but is more likely to be caused by indigestion. In highly-strung emotional people it is often the result of some violent emotion. The use of *digitalis* is often successful in strengthening and soothing the heart.—BIBLIOGRAPHY: R. O. Moon, *Diseases of the Heart*; J. Cowan, *Diseases of the Heart*.

**Heat**, a form of energy possessed by all bodies, and consisting of vibrations of the molecules, atoms, and electrons of these bodies. The most obvious physical effects produced by heat on matter are rise of temperature, change of dimensions, and change of state. When heat is supplied to a body, the temperature of the body will, as a rule, rise, the rise of temperature caused by a given quantity of heat depending on the thermal capacity of the body.

When heat is continuously supplied to a solid body, rise of temperature goes on until the solid reaches its melting-point, and the body gradually changes from the solid to the liquid state. During this change the temperature becomes stationary in crystalline bodies like ice; in other bodies, such as paraffin wax, the temperature rises more slowly than at first. Heat which is absorbed, during a change of state, without causing increase of temperature, is called *latent heat*. If the liquid continues to receive heat, its temperature rises until the boiling-point is reached. The temperature then becomes stationary, and the liquid boils until it has all been turned into vapour, latent heat being absorbed during the change from the liquid to the gaseous state.

Heat may pass from one body to another by one or other of the processes of conduction, convection, and radiation. In the process of conduction, heat is transferred

from particle to particle of a body, or from one body to another in contact with it. Substances vary in regard to their powers of conducting heat; metals have the highest conductivity, and of these silver is the best conductor. Liquids, with the exception of mercury and melted metals, are poor conductors of heat. Gases have the lowest conductivity of all bodies.

Convection of heat is brought about by the actual motion of the hot body. This is the usual process by means of which heat is distributed within liquids and gases.

Radiation of heat consists in the propagation of heat from a hotter body to a colder one through an intervening medium which is not heated during the process. The heat is transmitted by the same medium that transmits light from a luminous body, and it is propagated at the same speed as light. The rays which are given out from a luminous body are in part visible and in part invisible. Those rays which are not perceptible to the eye are partly heat rays (infra-red) and partly ultra-violet. Heat rays are further distinguished from the visible and ultra-violet rays by their greater wave-length, which ranges from about a fifty-thousandth of an inch to about a three-hundredth of an inch. Surfaces that are good radiators are also good absorbers, and surfaces which are good reflectors are bad radiators. The best radiating surface is one which is dull black. Hence a polished silver kettle retains heat much longer than a dark kettle.

A materialistic theory of the nature of heat was held by scientists up to the beginning of the nineteenth century, the most distinguished supporters of this view being Lavoisier and Black. The experiments of Rumford and Davy demolished this theory and substituted a dynamical theory, and between 1840 and 1843 Joule conclusively established the dynamical theory of heat by measuring the amount of energy required to produce a definite heating effect. The quantity of heat capable of increasing the temperature of 1 lb. of water by 1° F. requires for its evolution the expenditure of mechanical energy represented by the fall of 778 lb. through 1 foot. This amount of energy or work is called the dynamical equivalent of heat, or Joule's equivalent. See *Calorimetry*; *Thermodynamics*; *Thermometer*.—BIBLIOGRAPHY: C. H. Draper, *Heat and the Principles of Thermodynamics*; J. Clerk



Maxwell, *Theory of Heat*; E. Edser, *Heat for Advanced Students*.

**Heath**, the common name of many plants of the nat. ord. Ericaceæ. Only about a dozen species are European, most of the others being native to South Africa.

**Heather**, or **Ling** (*Calluna vulgaris*), a low shrub, order Ericaceæ, which covers extensive tracts of otherwise barren moorland in Western Europe, especially in the British Islands.

**Heathfield**, George Augustus Eliott, Lord (1717-1790), British general. He entered the British army in 1735, was wounded at Dettingen in 1743, and in 1762 took part in the capture of Havana. In 1775 he became commander-in-chief of the forces in Ireland, and soon after Governor of Gibraltar, which he successfully defended against the Spaniards and French in a siege of three and a half years' duration (June, 1779, to Feb., 1783).

**Heating**. In heating buildings, pipes of suitable diameter are used, of cast iron or malleable iron, 3 inches or 4 inches being standard diameters. These sizes distribute the heat very evenly, but sometimes it is not desirable to use such large sizes, and small diameters are used, the heating surfaces being obtained by using radiators, which are cast-iron tubes formed to hold a minimum amount of water and give a maximum of radiation. The water is heated in boilers made of malleable iron, formed in a saddle shape over the fire, and encased with brick-built flues. The modern type of boiler is made of cast iron, with waterway, and in sections connected by coned iron nipples. Each section is bolted to its neighbour, and when the sections are pulled tightly together the boiler is watertight, and any section can readily be replaced.

There are several methods in use for hot-water and for steam heating. Hot water with a maximum temperature of 200° F. gives the most suitable heat for dwellings and offices. In heating a house place a large radiator in the hall near the front door, so that its heat may diffuse through the house generally. It is also usual to warm the sitting-room, other public rooms, and certain bedrooms, but to leave the fire-places in public rooms for social gathering round the hearth at a small fire, and to warm the cold air at the windows by the radiator. This gives equable heating and ventilation.

Steam heating is used in large factories and works, in modern practice in this country. The steam is often the exhaust from the engine, and is either directed through pipes branching into the various rooms and under valve control, and finally exhausting to the air, or it may be diverted into coils of pipes with an iron casing and a centrifugal fan fitted preferably at its base; the pipes being arranged so that air forced by the fan will have the maximum heat contact with them. This air is drawn from a pure source to the fan, and a valve arrangement made so that this supply may be shut off, and the air of workshop used. The warmed air is forced from the top outlet of the casing, and circulates to a considerable radius. The waste water from the steam coil goes to a drain. Live steam up to 80 or 90 lb. per square inch may be used, and in this case the waste is returned by lifting traps to the feed tank of boiler for use.

When public buildings, such as poor-houses and hospitals, are in separate blocks, it is usual to have a central source of power for heat and light, consisting of steam boilers, Cornish or Lancashire type. For heating and hot-water supply, steam from the boilers is sent through copper coils fitted inside cylinders connected to these systems, and thereby warms the water which is pumped and circulated to the various buildings. Some of the large housing schemes have similar central-heating systems. In large towns central heating will help to keep the atmosphere pure, especially when the fuel in use is a proper type of coal, which has been coked. Where open fires are desired, they should be of the low-hearth type, with sides properly bevelled. See *Heating, Electric*.—**BIBLIOGRAPHY**: J. W. Hart, *The Principles of Hot Water Supply*; F. W. Raynes, *Heating Systems*.

**Heating, Electric**. When electricity flows through any conductor, a certain proportion of the electric energy is converted into heat, the amount being proportional to the resistance of the wire and the square of the current passing. An electric heater employs resistance wires in sections, or elements held on thin plates or tubes of quartz or other refractory material. The wires are raised to a red-heat, and in some cases parabolic reflectors are provided, so that the heat can be directed in any desired path. Non-luminous

types of heaters employ fine wire or metal-strip elements, either bare or covered with fireproof material mounted in an ornamental case or frame. In large units the convactor type of heater is provided with a fan to increase the air velocity over the heated coils. Electric kettles are constructed with a heating element as part of the base. Electric ovens are constructed with a number of heater elements connected in sections, so that the temperature can be regulated to suit the operations in progress. Electric irons are perhaps the most used of all domestic electrical appliances; in this case the heater element is fitted in a space in the base of the iron.

Heaton Norris, a district of England, Cheshire, forming a suburb of Stockport.

Hebburn, a town of England, North Durham, on the Tyne, above Jarrow, carrying on shipbuilding, and the manufacture of chemicals. Pop. (1931), 24,125.

Hebden Bridge, a town of England, West Riding of Yorkshire, 8 miles north-west of Halifax, with cotton manufactures, dyeworks, and foundries. Pop. (1931), 6312.

Hebe, in Greek mythology, the goddess of youth, and the cup-bearer to the gods, until replaced by Ganymede; a daughter of Zeus and Hera, who gave her as a wife to Heracles.

Heber, Reginald (1783-1826), English hymn-writer and bishop. He was consecrated Bishop of Calcutta in 1823, but had only occupied the position for about two years when he died of apoplexy. In addition to his hymns (*Brightest and best of the sons of the morning, From Greenland's icy mountains, &c.*) he published *Poems and Translations*.

Hébert, Jacques René (1757-1794), French Revolutionist. He was named Attorney-General under the Commune. He was one of those who established the worship of Reason, and he was always on the side of savage measures. Having denounced Danton, the latter, in conjunction with Robespierre, secured his execution.

**Hebrew Language and Literature**, the language and literature of the Jews, Israelites, or Hebrews, especially at that period when they formed a compact nation inhabiting Canaan or Palestine. (For a sketch of the history of the people, see *Jews*.) The Hebrew language forms a branch of the Semitic family of languages,

being akin to the Aramaic (Chaldee and Syriac), Arabic, Ethiopic, and Assyrian. The alphabet is composed of twenty-two

Form.	Name.	Pronunciation.
	Final	
א	<i>Aleph</i>	' (smooth breathing).
ב	<i>Beth</i>	<i>b</i> ( <i>bh</i> ).
ג	<i>Gimel</i>	<i>g</i> ( <i>gh</i> ).
ד	<i>Daleth</i>	<i>d</i> ( <i>dh</i> ).
ה	<i>He</i>	<i>h</i> .
ו	<i>Ware</i>	<i>w</i> , <i>v</i> .
ז	<i>Zayin</i>	<i>z</i> .
ח	<i>Heth</i>	<i>h</i> .
ט	<i>Teth</i>	<i>t</i> (emphatic).
י	<i>Yod</i>	<i>y</i> .
כ	<i>Kaph</i>	<i>k</i> ( <i>kh</i> ).
ל	<i>Lamed</i>	<i>l</i> .
מ	<i>Mem</i>	<i>m</i> .
נ	<i>Nun</i>	<i>n</i> .
ס	<i>Samekh</i>	<i>s</i> .
ע	<i>'Ayin</i>	' (rough breathing).
פ	<i>Pe</i>	<i>p</i> ( <i>ph</i> ).
צ	<i>Sade</i>	<i>s</i> (emphatic).
ק	<i>Qoph</i>	<i>q</i> (guttural <i>k</i> ).
ר	<i>Resh</i>	<i>r</i> .
ש	<i>Shin, Shin</i>	<i>s</i> , <i>sh</i> .
ת	<i>Taw</i>	<i>t</i> ( <i>th</i> ).

Form, Name, and Pronunciation of the Letters of the Hebrew Alphabet

consonants, the vowels being expressed by marks above or below these letters. The accents and marks of punctuation amount to about forty. The writing is from right to left. The extant classical

Hebrew writings embrace a period of more than 1000 years from the era of Moses to the date of the composition of the books of *Chronicles*, which stand last in the Hebrew Bible. The writings which belong to the age subsequent to the Babylonish captivity differ very considerably from those which belong to the preceding age; the influence of the Aramaic or Chaldee language, acquired by the Jews in the land of their exile, having greatly corrupted the tongue. At what time Aramaic became the dominant element in the national language it is impossible to determine, but it entirely took the place of the old Hebrew as a spoken tongue. The fragments of the popular language in the New Testament are all Aramaic; and ever since the Hebrew proper has been preserved and cultivated only as the language of the learned and of books and not of common life. After the return from the captivity, Jewish literature was carefully cultivated. Under Ezra the Scriptures were collected, and arranged into a canon. The *Pentateuch* was publicly read, taught in schools, and translated into Aramaic. The legal or religious traditions explanatory or complementary to the law of Moses were collected and established as the oral law. These labours resulted in the *Midrash*, a general exposition of the Old Testament, divided into the *Halacha* and the *Haggada*. On being driven from their capital by the Romans, numerous schools were established by the Jews in which their language and literature were taught. Of these schools the most celebrated were those of Babylon and Tiberias. The *Mishna*, which contains the traditions of the Jews and interpretations of the Scriptures, is supposed to have been compiled in the latter part of the second or in the earlier part of the third century; and the rabbis of Tiberias and Babylon wrote numerous commentaries on it. These commentaries were at length collected into two separate works, the *Jerusalem* and the *Babylonian Talmuds*. The *Jerusalem Talmud* seems to have been completed about the end of the fourth century, and the *Babylonian Talmud* about a century later, under the care of Rabbi Ashe. What are called the *Targums*—that is Aramaic translations of portions of the Old Testament—belong partly to times somewhat anterior, partly to times subsequent to this period.—BIBLIOGRAPHY:

Wright, *Lectures on the Comparative Grammar of the Semitic Languages*; I. Abrahams, *Short History of Jewish Literature*.

Hebrews, *Epistle to the*, one of the canonical books of the New Testament, the canonicity and authorship of which have been much discussed. The immediate successors of the Apostles (Clement of Rome, Justin Martyr, &c.) seem to have considered it as of canonical authority. Its canonicity was also maintained by St. Jerome, by the almost universal consent of the Latin and Greek Churches, and by Ambrose of Milan; while in A.D. 416 a decretal of Innocent III was issued in favour of this view. The Pauline authorship, which was denied by the early Roman Church, became generally accepted throughout Christendom, but in modern times the prevalent opinion is that St. Paul was not the author.

Hebrides, or Western Islands, a group of islands and islets off the west coast of Scotland, divided into the Outer Hebrides (popularly called the Long Island), of which the principal are Lewis and Harris, North Uist, Benbecula, South Uist, and Barra; and the Inner Hebrides—Skye, Mull, Islay, Jura, Coll, Rum, Tiree, Colonsay, &c. The Outer are separated from the Inner, and from the mainland, by a strait called the Minch, 12 miles broad, and consist of a continuous series of islands and islets, running south-west and north-east through a space of 130 miles. In the outer group are also St. Kilda and the Flannan Isles. The Hebrides are divided between the shires of Ross, Inverness, and Argyll. They number about 520 in all, but only about 120 are inhabited; area, about 2800 sq. miles; pop. c. 60,000. The islands are, on the whole, mountainous, and abound in moss and moor. Although humid, the climate is mild. The soil is mostly poor, and agriculture, except in certain localities, especially Islay, is very backward. Cattle and sheep-rearing and fishing are staple industries, the land being held generally by small crofters. The landlords, as a rule, retain their estates for sporting purposes. Whisky is distilled in Skye, Mull, and Islay, tweeds are made in Harris, iron is found in Raasay, and slate in Luing. Gaelic is the universal language, although English is now well known. In the Outer Hebrides the majority of the people are Roman Catholics, and the whole group is renowned for its wealth

of Celtic story and song. The Hebrides were early colonized by Norwegians, and belonged to Norway from the ninth to the thirteenth century, being annexed to Scotland in 1265. In 1346 a chief of the MacDonald clan assumed the title of 'Lord of the Isles', and he and his successors affected a sort of semi-independence, but the Hebrides were finally annexed by James V. in 1540. After the European War the prevalent trade depression and poverty caused hundreds of Hebrideans to emigrate to Canada.—BIBLIOGRAPHY: R. Buchanan, *The Hebrid Isles*; C. F. Gordon-Cumming, *In the Hebrides*; W. C. Mackenzie, *History of the Outer Hebrides*; A. Smith, *A Summer in Skye*.

Hebron, a town in Palestine, 18 miles south by west of Jerusalem. It lies in the narrow valley of Mamre, and was one of the three cities of refuge west of the Jordan. Hebron was the residence of Abraham and the patriarchs, and at one time of David. Pop. 16,577.

Hecateus of Miletus (c. 550–476 B.C.), Greek historian and geographer. He visited Egypt, Thrace, Greece, the coasts of the Euxine, Italy, Spain, and Africa. His two great works were his *Tour of the World* and his *Genealogies or Histories*. Only fragments of his writings are extant.

Hecate, a Greek goddess, whose powers were various. She could bestow wealth, victory, and wisdom; good luck on sailors and hunters; prosperity on youth and on the flocks. She was afterwards confounded with other divinities, such as Demeter, Artemis, and Persephone (Proserpine), and finally became especially an infernal goddess, and was invoked by magicians and witches.

Hedmondwike, a town of England, county of York (West Riding), with blanket, carpet, woollen cloth, and woollen yarn manufactories. Pop. (1931), 8991.

Hector, the son of Priam and Hecuba, the bravest of the Trojans, whose forces he commanded. His wife was Andromache. His exploits are celebrated in the *Iliad*. Having slain Patroclus, the friend of Achilles, the latter sought revenge, and Hector was slain by him. The body of Hector was dragged at the chariot wheels of the conqueror; but afterwards it was delivered to Priam for a ransom, who gave it a solemn burial.

Hecuba, of Phrygia, in Greek legend the second wife of Priam, King of Troy, to

whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus.

Hedgehog (*Erinaceus europæus*), an insectivorous mammal, partly covered with spines, which can roll itself up into a ball for protection. It is about 11 inches long, with an elongated snout, short ears, and coarse hair over part of its body. It lives in woods and eats fruit, roots, and insects. If kept indoors it will devour cockroaches. It hibernates in winter. The female bears four to six young at a birth. It is found in most parts of Europe. Other species are found in Asia and Africa. See Plate, *British Mammalia*.

Hedge-warbler, or Hedge-sparrow (*Accentor modularis*), a common reddish-brown British bird, about 5½ inches long, of the sub-family Sylviinae. It builds early and its nest is often the one to be used by the cuckoo. Its song is plaintive.

Hedin, Sven (1865– ), Swedish traveller and explorer. Supported by King Oscar II, he began in 1893 a series of exploratory journeys in Central and Eastern Asia, traversing the Pamir Plateau, the region around the Lop Nor Lake, Northern Tibet, and after many hardships finally reaching Peking, from which he returned to Europe across North China and Siberia (1897). In 1899 he entered on a similar extended course of travel, further investigating the Lop Nor region and the connected deserts, and attempting to reach Lhasa in the guise of a pilgrim, but being turned back by the Tibetans. In 1908 he made important discoveries in the mountainous region north of the Himalayas, the 'Trans-himalayan Range'. He has produced a number of works on his travels, some translated into several languages. They include: *Through Asia* (1898); *Central Asia and Tibet* (1903); *Overland to India* (1910); *The War against Russia* (1915); and *My Life as an Explorer* (1926).

Hedmark, a fylke or county of East Norway. It borders on Sweden, is mountainous in the north, and contains numerous lakes. The valley of Upper Glommen is one of the most fertile regions in Norway. Area, 10,636 sq. miles; pop. 149,619.

Hedonism, the philosophical theory that pleasure is the highest human good, and that every man's goal is his own happiness and pleasure. The Cyrenaics,



Epicurus, and even Hobbes and Locke, were hedonists, teaching that pleasure was the supreme end for the individual. See *Utilitarianism*.—Cf. J. Watson, *Hedonistic Theories from Aristippus to Spencer*.

Heem, Jan Davidz de (c. 1600–c. 1683), Dutch painter. He is the chief master, and in some respects the inventor, of a highly-elaborate phase of still-life painting in the Netherlands, well represented in the Wallace Collection. His son, *Cornelius de Heem* (born 1630) imitated him, but is inferior to him.

Heemskerk, Martin, or Van Veen (1498–1574), Dutch painter. His earlier paintings are marked by the realism of the earlier Dutch painters; his later show an increasing amount of mannerism due to imitation of Michael Angelo and the antique. His *Last Judgment* is in the palace of Hampton Court.

Heerlen, a town of Holland, province of Limburg, 14 miles east of Maastricht, and 10 miles N.N.W. of Aachen. Pop. 34,029.

Hegel, Georg Wilhelm Friedrich (1770–1831), German metaphysician. After being a private tutor for several years, Hegel was employed on a newspaper at Bamberg until 1808, when he became successively rector of Nürnberg Gymnasium, professor of philosophy at Heidelberg (1816), and at Berlin from 1818 to his death. Among his works the most important are his *Phänomenologie des Geistes* (1807), *Wissenschaft der Logik* (1812–1816), *Encyclopädie der philosophischen Wissenschaften* (1817), and *Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft* (1821). The philosophy of Hegel adopts as a presupposition the identity of Knowing and Being, of Thought and Reality, of Subjective and Objective. He asserts that if the order and connexion of our thoughts are involved in the order and connexion of things, the universal form in the course of objective action must exactly agree with the form of the development of our thoughts, and vice versa. As there are, according to him, three stages in the process of thought and existence, his system has necessarily a threefold division: logic, the philosophy of nature, and mental philosophy. In England the Hegelian system was expounded by E. Caird and T. H. Green.—BIBLIOGRAPHY: E. Caird, *Hegel*; A. Seth Pringle-Pattison, *Hegelianism and Personality*.

Heiberg, Johan Ludvig (1791–1860), Danish poet and critic, son of the satirist Peter Andreas Heiberg (1758–1841). Among his works are: *The Theatre for Marionettes*, *A Soul After Death*, and *The Newly Wedded*.

Heidelberg, a town of Baden, on the left bank of the Neckar. It has a castle (fifteenth century) and a university (1386). The principal industry is brewing. One of the greatest curiosities of the place is the Heidelberg tun, kept in a cellar under the castle. It is 36 feet in length, 26 feet in diameter, and capable of holding 800 hogsheads. Heidelberg was long the capital of the Palatinate, but was superseded by Mannheim in 1720. Pop. (1925), 73,034.

Heidenheim, a town of Württemberg, 46 miles E.S.E. of Stuttgart. It has manufactures of woollen and linen cloth. Pop. (1925), 19,363.

Heights, Measurement of, or Hypsometry, the measurement of the absolute or relative heights of various points on the earth's surface. Trigonometrical methods may be employed, or the result may be obtained by levelling, by the use of the barometer, or by the boiling-point of water as given by the thermometer. A rule which serves for rough purposes is to multiply the difference of the logs of the barometric heights by 60,000; this gives the difference of levels of the two stations, in feet. For moderate heights, the boiling-point is lowered 1° F. for about every 600 feet of ascent. These barometric and boiling-point methods are not used now in accurate work, the uncertainties due to weather changes being too great. For modern methods, see *Levelling*; *Surveying*.

Heijo-fu. See *Phyong-yang*.

Heilbronn, a town of Württemberg, on the Neckar. It has flourishing industries, including the manufacture of paper, sugar, and silverware. Pop. (1925), 45,520.

Heilung Hsien, another name of Tsitsihar (q.v.), capital of Heilungkiang.

Heilungkiang, a province of Manchuria, bounded north by the Amur, and east by the Sungari. The chief products are skins and furs, and the capital is Tsitsihar. Area, 203,000 sq. miles; pop. 1,560,000.

Heine, Heinrich (1797–1856), German poet and author. He studied law at Bonn, Berlin, and Göttingen. He afterwards lived at Hamburg, Berlin, and Munich, but in 1830 he settled in Paris, and dwelt

there until his death. Among his works are: *Gedichte* (Poems), *Reisebilder* (Pictures of Travel), *Buch der Lieder* (Book of Songs), *Deutschland, Ein Wintermärchen* (Germany, a Winter Tale), *Shakespeares Mädchen und Frauen* (Maidens and Wives), *Die Romantische Schule*, *Letzte Gedichte und Gedanken* (Last Poems and Thoughts), *Atta Troll*, and *Romanzero*. As a poet Heine is remarkable for the simplicity and pathos of many of his lyric pieces. His powers of wit and raillery were also great. Cf. W. Stigand, *Life, Works, and Opinions of Heinrich Heine*.

Heinsius, Daniel (1580-1655), Dutch scholar, poet, and critic. He published editions of Hesiod, Horace, Virgil, and other classical writings, and wrote Latin and Greek poems (*Iambi, Elegice, Poemata, &c.*).

Hejaz, a kingdom of Arabia stretching along the Red Sea from south of 'Aqaba to Hali Point. All the inland boundaries are uncertain, but it borders on Syria in the north, Nejd and the Arabian Desert in the east, and Asir in the south. The area is estimated at 170,000 sq. miles, and the population at 900,000. The whole country is barren or semi-barren, though a little wheat and barley and a considerable amount of dates are produced in the south. Dates are the chief product but are all consumed locally, and the exports, which are of little value, are hides, wools, and gum. The country, by virtue of its possession of Mecca and Medina, the Holy Places of Islam, is the most important in Arabia. Mecca is the capital, Taif the summer capital, and Jidda the principal seaport. It was formerly a Turkish vilayet, and the Hejaz Railway (completed in 1908), connecting Aleppo and Damascus to Medina, enabled the Turks to maintain garrisons throughout the country. In spite of this, however, the Grand Sherif or Emir of Mecca wielded great influence throughout the whole Moslem world, and thus, when the European War broke out and the Turks joined Germany, the Sherif Husein Ibn Ali, who had been promised autonomy by Britain in the event of a successful revolt, declared the independence of his country in 1916. He was then proclaimed King of the Hejaz, and by the Treaties of Sévres and Lausanne the Hejaz was recognized as an independent state. In 1917 Husein assumed the title of King of Arabia, though this was deeply

resented by the other Arabian states and was not recognized by Britain. For several years Britain paid Husein a monthly subsidy, but this was ultimately discontinued. In 1924 the Wahabis, a tribe inhabiting the neighbouring Emirate of Nejd and Hasa, invaded the Hejaz and overran the country. Husein, owing to the inability of his Government to protect the Holy Places, was forced to abdicate, and his eldest son the Sherif Ali, Emir of Medina, succeeded him. Before negotiations for peace could be arranged, Mecca fell and Jidda was invested. To understand the situation it is necessary to note that the people of Hejaz are Hashimites, the descendants of the prophet's own tribe, while the Wahabis are a wild, war-like race, who hold the rigorous, austere creeds of early Islam, deprecating luxuries and pilgrimages to Holy Places. In Dec., 1925, Ali abdicated and fled to Baghdad. On the same day the Wahabis under Ibn Saud entered Jidda, and in Jan., 1926, Ibn Saud was proclaimed King of the Hejaz. (See *Nejd*.) Ibn Saud rules Hejaz in accordance with a Constitution framed in 1926. Ma'an vilayet was added to Transjordan in 1925.—Cf. H. St. J. B. Philby, *The Heart of Arabia*.

Hejira, or Hegira, the flight of Mahomet from Mecca to Medina. From this flight in the year 622 the Mahommedans begin their computation of time.

Hekla, a volcano of Iceland, about 5000 feet high. It has several craters, is always covered with snow, and has had several eruptions, the last being in 1878.

Helder, The, a fortified seaport of Holland, province of North Holland, opposite the Island of Texel, and commanding the entrance to the Zuider-Zee. From a fishing-town Napoleon converted it, in 1811, to a fortress and naval station. The outer harbour is 26 feet and the inner harbour (Government naval) 23 feet deep. There are two dry-docks. Pop. 29,554.

Helen, or Helena, in Greek legend, the most beautiful woman of her age, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterwards carried off to Troy by Paris, the Trojan War arising from the claim made by Menelaus for the fulfilment of the oath.

Helena, St. (c. 247-327), mother of

the Emperor Constantine the Great. She did much for the advancement of Christianity, and is said to have discovered the *true cross*, in honour of which she founded the Church of the Holy Sepulchre at Jerusalem.

**Helena**, the capital of Montana, U.S.A., at the foot of the Rocky Mountains, 15 miles west of Missouri River. It is chiefly supported by the rich quartz and (placer) gold-mines in the vicinity. Pop. 12,037.

**Helensburgh**, a burgh of Scotland, in Dumbartonshire, situated at the entrance of the Gare Loch, on the north shore of the Firth of Clyde, opposite Greenock. It is chiefly a residential town and summer resort for Glasgow and neighbouring towns. Pop. (1931), 8893.

**Helicon**. See *Sagara*.

**Heligoland**, an island belonging to Germany, in the North Sea, about 40 miles from the mouth of the Elbe;  $1\frac{1}{2}$  miles long and  $\frac{1}{2}$  mile broad. In 800 A.D. it was 120 miles in circumference, but has been reduced by erosion to its present 3 miles. Heligoland was captured by Britain from Denmark in 1807, and ceded to Germany in 1890, in return for Germany's recognition of the supremacy of British interests in Zanzibar. The inhabitants were transferred to the mainland, sea-walls to prevent erosion were built, enormous fortifications, gun emplacements, and a huge naval harbour were constructed, and the island became practically impregnable. Under the terms of the Treaty of Versailles (1919) it was entirely dismantled.

**Heliodoros**, of Emesa in Syria (third century A.D.), Greek romance writer. His novel is known as the *Æthiopica*, because its opening and closing scenes are laid in Æthiopia; it is also called *The Loves of Theagenes and Chariclea*. It is written in ten books, in a poetical kind of prose. It is by far the best extant Greek romance. Its plot is well managed, its characters are well drawn, and it abounds in pleasant descriptions of scenery, and vivid portrayal of manners and customs. There is a famous Elizabethan translation of the *Æthiopica*, by T. Underdowne, published in 1587.

**Elagabalus**, or **Elagabalus** (205–222), Roman emperor. After the death of Macrinus (218) he was invested with the imperial purple, but his licentiousness soon displeased the populace, and he was slain in an insurrection of the prætorians.

**Heliograph**, a name given to various

contrivances for reflecting the sun's light either temporarily or continuously to an observer at a distance. The simplest heliograph is a mirror hung up at a distant station so as to reflect a flash to the observer. Some heliographs are visible for 80 miles. The principal use of the heliograph is for signalling in war.

**Heliopolis** (City of the Sun), the On, Rameses, or Beth-shemesh of the Hebrew Scriptures; now called Matarieh; situated a little north of Memphis. It was a centre of sun-worship at an early period in Egyptian history. Although Heliopolis suffered decline as a political centre after the rise of Thebes, it continued to be a centre of learning. Near the village stands the Pillar of On, and Cleopatra's Needle on the Thames Embankment, London, once stood in front of the great Ra temple.

**Helios**, the god of the sun (Lat. *Sol*) in Greek mythology; son of the Titan Hyperion.

**Heliostat**, a contrivance used in solar observation, whereby the telescope through which the observer looks can be kept fixed in one position, while the light from the sun is fed into it by apparatus arranged to move in such a manner as to follow the sun in the course of its diurnal motion due to the earth's rotation. The heliostat is largely used in connexion with spectroscopic work, for eclipse observations, or with the great horizontal telescopes.

**Heliotrope**, a genus of plants (*Heliotropium*), nat. ord. Boraginaceæ. *H. europæum*, the common heliotrope, is indigenous in the south and west of Europe, and has small white or pale-red flowers with a fruit of four drupes under a thin fleshy covering.

**Heliotrope**, the bloodstone, a variety of quartz, partaking of the character of jasper or of chalcedony. It is of a deep-green colour, and covered with red spots. It is hard, and is used for burnishers; the more finely-marked stones are prized for seals, and signet-rings.

**Helium**, a chemical element, symbol He, originally discovered by Rayleigh and Ramsay in the chromosphere of the sun by means of the spectroscope. Ramsay afterwards discovered the element in the gases given off when certain minerals are heated. It is contained in minute quantity in the atmosphere, and in larger quantity in American natural gas. Helium is a colourless gas which liquefies at  $-268^{\circ}\text{C}$ ;



it is non-inflammable, and next to hydrogen is the lightest gas known. The  $\alpha$ -particles expelled from radium are atoms of helium which have lost two electrons. After it was found possible to isolate the gas in quantity, Ramsay proposed its use in air-craft, as its lifting power is almost as great as that of hydrogen, and it has the advantage over the latter in being non-inflammable. At the beginning of the European War the gas cost £350 per cubic foot, a price which prohibited its use on a large scale. Plants were erected, however, to recover helium from the gas-wells of Texas and Oklahoma, and a yield of about  $\frac{1}{2}$  per cent was obtained from the natural gases at comparatively small cost. The only commercial source of helium in the British Empire is in Canada (Alberta and Ontario), while the most productive wells in the world are in Kansas, U.S.A.

**Hellebore** (*Helleborus*), a genus of plants, nat. ord. Ranunculaceæ, consisting of perennial low-growing plants with leathery leaves, and yellowish, greenish, or white flowers, having five conspicuous persistent sepals. *H. niger*, the Christmas-rose common in gardens, is the source of the black hellebore. *H. viridis* and *H. foetidus* are herbaceous plants with green flowers, and grow in Britain.

**Hellenists**, a name for those Jews who, especially in Egypt after the time of Alexander the Great, became imbued with Greek culture and civilization, and spoke and wrote in Greek. The most noted of the Jewish Hellenistic philosophers was Philo of Alexandria, and the chief of the learned labours of the Alexandrian Jews was the *Septuagint* version of the Old Testament.

**Hellespont**. See *Dardanelles*.

**Hellevoetsluis**, a fortified seaport of the Netherlands, province of South Holland, situated 18 miles south-west of Rotterdam, on the Haringvliet, the largest mouth of the Rhine. It is an important Dutch naval base (depth about 20 feet), and has dry-docks, arsenals, &c. Pop. 4355.

**Hell Gate**, a formerly dangerous pass in East River, U.S.A., the strait connecting New York Bay with Long Island Sound. The passage has now been cleared.

**Hellin**, a town of Spain, province of Albacete. It has manufactures of woollens, leather, and pottery, and a trade in wine and oil. At Minas del Mundo, several miles

to the south, are famous sulphur-mines. Pop. 17,800.

**Helmand**, a river of Afghanistan, rising in the Hindu Kush, and falling after a course of 700 miles into Lake Hamun in the south-west.

**Helmholtz**, Hermann-Ludwig Ferdinand von (1821–1894), German physiologist and physicist. In 1871 he was appointed professor of physics at Berlin. His work was chiefly in those departments of physics which are in closest relation with physiology, notably in acoustics and optics. Of his many publications the best known are: *The Conservation of Force*, *Manual of Optics*, *Popular Lectures on Scientific Subjects*, and *Sensations of Tone as a Physiological Basis for the Theory of Music*.

**Helmond**, a town of Holland, province of North Brabant, on the Aa. The industries include the manufacture of cotton and silk goods and the making of soap, tobacco, and beer. Pop. 20,177.

**Helmont**, Jean Baptiste van (1577–1644), Belgian physician and chemist. He boasted of having found the means of prolonging life, composed visionary theories on the constitution of man and on diseases, and made some genuine discoveries in chemistry. Van Helmont was the first to introduce the term *gas* into science, and was also the first to observe the acid reaction of the gastric juice. His works were published at Amsterdam under the title *Ortus Medicinæ, vel opera et opuscula omnia* (1668).

**Helmstedt**, a town in Brunswick, formerly a member of the Hanseatic League. Earthenware and agricultural machinery are manufactured. Pop. 16,420.

**Heloderma**, a North American genus of lizards, of which the Mexican species, *H. horridum*, has been proved to be venomous, all its teeth being furnished with poison glands. It is about 2 feet in length, and is nocturnal in habit. The only other species (*H. suspectum*), known as the Gila monster, is native to New Mexico and Arizona.

**Heloise**, or **Eloise** (1101–1164), wife of Abélard (q.v.).

**Helots**, slaves in ancient Sparta, the lowest of the four classes into which the population of the city was divided. They were the property of the State, which assigned them to certain citizens, by whom they were employed in private labours.



Agriculture and all mechanical arts at Sparta were in their hands, and they were also obliged to bear arms for the State in case of necessity.

**Helsingborg**, former name of Hälsingborg (q.v.).

**Helsingfors**, a seaport, capital of the Republic of Finland, on a peninsula in the gulf of that name. It contains a university, removed from Åbo in 1827. It has manufactures of linen, sail-cloth, and tobacco, an important trade in timber, corn, and fish, and one of the best harbours in the Baltic. The largest ships can enter the harbour, and the depth alongside is 26 feet. There is a dry-dock. Pop. 200,208.

**Helsingör** (Elsinore), a seaport of Denmark, on the Island of Zealand, at the narrowest part of the Sound opposite Hälsingborg in Sweden, and connected with it by train-ferry. There is a castle commanding the Sound. All merchant ships passing through the Sound had, till 1857, to pay toll at Helsingör. There is accommodation for ships drawing 25 feet, and there are two dry-docks. The exports are agricultural and dairy produce. Pop. 14,000.

**Helst**, Bartholomew van der (1611–1670), Dutch portrait-painter. His single portraits, such as the *Paul Potter* at the Hague, are his best works; though Reynolds warmly praised his *Master of the Burgher Guard*, which is at Amsterdam.

**Helvellyn**, one of the highest mountains of England, county of Cumberland, between Keswick and Ambleside; height, 3313 feet.

**Helvetii**, anciently a Gallic or Celtic people dwelling in the country now nearly corresponding with Switzerland. They were not much known to the Romans until the time of Julius Caesar, who, as Governor of Gaul, prevented their intended emigration, and after many bloody battles pressed them back within their frontiers.

**Helvétius**, Claude Adrien (1715–1771), French philosophical writer. In 1758 he published his one important book, *De l'Esprit* (On the Mind), the materialism of which drew upon him many attacks. It was condemned by the Sorbonne, and publicly burned by decree of the Parliament of Paris. He also wrote a work, *De l'Homme*, and an allegorical poem, *Le Bonheur*.

**Helwan**, a health-resort in Egypt,

about 14 miles south-east of Cairo, with warm sulphur, saline, and chalybeate springs, which now attract many visitors. The place is an artificial oasis, to which water is conveyed from the Nile, 3 miles to the west.

**Hemans**, Felicia Dorothea (1793–1835), English poet. She first appeared as an author in 1808, with a volume entitled *Early Blossoms*, which was followed in 1812 by her more successful volume *The Domestic Affections*. Her other works include: *Lays of Many Lands*, *Forest Sanctuary*, *Records of Woman*, *The Songs of the Affections*, *Hymns for Childhood*, *National Lyrics and Songs for Music*, and *Scenes and Hymns of Life*. Her poetry is essentially lyrical and descriptive, and is always sweet, natural, and pleasing.

**Hematite**. See *Iron*.

**Hemel Hempstead**, a market town of England, Herts, 6 miles west of St. Albans, carrying on paper-making, iron-founding, straw-plaiting, &c. Pop. (1931), 15,122.

**Hemerobiidæ**, the ant-lions, lace-wing flies, &c., a family of neuropterous insects, noted for their predaceous larvæ.

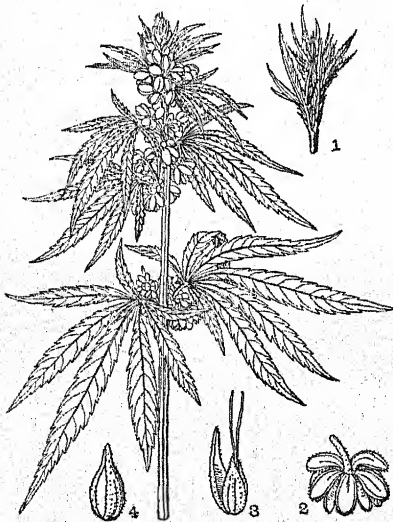
**Hemiptera**, bugs, an order of four-winged insects, having a suctorial proboscis, the outer wings, or wing-covers, either entirely formed of a substance intermediate between the elytra of beetles and the ordinary membranous wings of most insects, or leathery at the base and transparent towards the tips. The order is divided into two large sub-orders, Homoptera and Heteroptera, differing in the structure of the wings. To the Hemiptera belong the plant-lice, boat-fly, cochineal and other scale-insects, bed bug, lantern-fly, &c.

**Hemlock**, a poisonous plant, *Conium maculatum*, nat. ord. Umbelliferae, a tall, erect, branching biennial, with a smooth, shining, hollow stem, usually marked with purplish spots, elegant, much-divided leaves, which when bruised emit a nauseous odour, and white flowers in compound umbels of ten or more rays, surrounded by a general involucre of three to seven leaflets. Hemlock is a powerful sedative, and is used medicinally. The extract is considered the best preparation. The virtues of hemlock are due to the alkaloid coniine.

**Hemorrhoids**, or **Piles**, are a varicose condition of the veins surrounding the anus and lower part of the rectum. In

the mild form the condition is very common, and when more severe causes much pain and discomfort, requiring an operation for relief. The predisposing causes are sedentary occupation, alcoholic excess, and chronic constipation. The hemorrhoids may be either external or internal, or both conditions may be present together. When the internal variety is alone present, hemorrhage from the rectum is often the first sign, and this hemorrhage becomes gradually more frequent and severe. Treatment consists of avoidance, as far as possible, of the predisposing causes, especially chronic constipation.

**Hemp** (*Cannabis sativa*), a plant, the only known species of the genus *Cannabis*,



Hemp Plant (male)

- 1, Female spike. 2, Male flower.  
3, Female flower. 4, Fruit.

nat. ord. Moraceæ. It is an annual herbaceous plant and is a native of Central Asia. It is extensively grown in India, especially in the north-west Himalayas, Sind, Bombay, and the Central Provinces. Hemp also comes from Africa, Brazil, Malay, the Philippines, Russia, Poland, and Italy. Italian hemp is of excellent quality. The Indian variety, often known

as *Cannabis indica*, is the source of the narcotic drug variously known as *hashish*, *bang*, or *gunjah* (see *Hashish*). Hemp fibre is of commercial value, the coarser being used for sail-cloth, ropes, &c., and the finer for shirtings, sheetings, &c. Hemp-seed is much used as food for cage-birds, and also yields an oil. Sisal hemp or 'henequen' and Manila hemp are not true hemsps.

**Henbane**, a plant of the genus *Hyoscyamus*, nat. ord. Solanaceæ. The only British species is *H. niger*, a native of Europe and Northern Asia. It is a coarse erect biennial herb, found in waste ground and loose dry soil. The expressed juice of the leaves and seeds contains several alkaloids, and is often used as a sedative, antispasmodic, and narcotic.

**Henderson**, Arthur (1863– ), British labour politician. An engineer to trade, he entered Parliament in 1908, and was chairman of the parliamentary Labour party 1908–1910 and 1914–1917. He was appointed secretary to the Labour party in 1911. He has been President of the Board of Education (Coalition Government, 1915), Paymaster-General and Government Labour Adviser (Coalition Government, 1916), Minister without portfolio (Lloyd George War Cabinet, resigned 1917), and Home Secretary (Labour Government, 1924). Henderson was with the Government Mission to Russia in 1917. He was Foreign Secretary 1929–31.

**Hendon**, an urban district of Middlesex, forming a suburb of London, north-west of Hampstead. Mill Hill Grammar School is here. Hendon is now an aviation centre, and there are flying-schools and aeroplane-works. Pop. (1931), 115,682.

**Hengelo**, a town, Netherlands, province of Overijssel, 27 miles east of Deventer. It is an important railway centre, and manufactures textiles. Pop. 27,286.

**Hengest** (fifth century A.D.), prince of the Jutes, founder of the Kingdom of Kent in Great Britain, in conjunction with his brother Horsa. In A.D. 449 the Britons sued for aid from the Saxons against the inroads of the Scots and Picts. The Saxons under Hengest and Horsa accordingly landed at the mouth of the Thames, and defeated the northern tribes near Stamford in A.D. 450. Being reinforced from home, they afterwards united with the Scots and Picts against the Britons, whom they ultimately dispossessed.

Henley, William Ernest (1849–1903), English poet, critic, and journalist. His first publication, *In Hospital: Rhymes and Rhythms* (1888), was inspired by his own experiences as a patient in Edinburgh Infirmary, in which city he met and became a friend of Robert Louis Stevenson, his collaborator in several plays. *A Book of Verses* appeared in 1890, *The Song of the Sword and other Poems* in 1892, and a collected edition of his poems in 1893, followed by a fresh volume of verse, *For England's Sake*, in 1900.

Henley-on-Thames, a borough of England, in Oxfordshire, on the left bank of the Thames, 35 miles west of London. It is famed for its annual regatta. Pop. (1931), 6618.

Henna, a shrub (*Lawsonia inermis*), nat. ord. Lythraceæ, with white flowers, found in moist places. In the east it is used to dye finger-nails, and in Europe to dye hair; it is also used in the dyeing of materials.

Henry I, surnamed *The Fowler* (c. 876–936), German emperor. He was the son of Otho the Illustrious, Duke of Saxony. On the death of his father he became Duke of Saxony and Thuringia, was elected Emperor of Germany in 919, and was the true founder of the empire. By his prudence and activity Suabia and Bavaria were forced to tender allegiance, and Lorraine was reunited to the German Empire in 925. He was defeated by the Hungarians, whom, however, he routed in 933.

Henry II, *The Saint* (972–1024), Emperor of Germany. A son of Henry the Quarreller of Bavaria, and great-grandson of the Emperor Henry I, he inherited Bavaria in 995, and on the death of Otho III in 1002 laid claim and was elected to the empire. After repeated campaigns he succeeded in recovering Bohemia, and in 1018, in the Peace of Budissin (Bautzen), reduced Boleslas of Poland to complete subjection.

Henry III (1017–1055), Emperor of Germany, son of the Emperor Conrad II. He was chosen king in 1026, and succeeded his father in the imperial dignity in 1039. He weakened the power of the great feudal lords, and forced the Duke of Bohemia in 1042, and the King of Hungary in 1044, and again in 1047, to accept their dominions as imperial fiefs. In 1046 he deposed the rival Popes Benedict IX,

Sylvester III, and Gregory IV, and caused Suitger, Bishop of Bamberg, to be elected in their stead as Clement II.

Henry IV (1050–1106), German Emperor, son of Henry III. At the death of his father he was only five years old. His treatment of the conquered Saxons was such that they complained to the Pope, and Gregory VII (Hildebrand) accordingly summoned Henry, in 1076, to appear before him at Rome. Henry not only disregarded the order, but instigated the bishops, assembled by his order at Worms, to renounce their obedience to the Pope. Gregory, however, pronounced sentence of excommunication against him, and Henry, finding himself deserted, was obliged to go to Italy and make his submission to the Pope (1077). The insolence with which the Pope used his victory produced a reaction. At the Council of Brixen, in 1080, Gregory was deposed by the German and Italian bishops as a heretic and a sorcerer, and Guibert, Archbishop of Ravenna (Clement III) set up in his place. In 1084 Henry succeeded in establishing Clement at Rome. His second son, Henry, however, made himself master of his father's person in 1105 by strategem, and compelled him to abdicate.

Henry V (1081–1125), Emperor of Germany, the son and successor of Henry IV. On his ascension the question of investiture distracted the empire anew. Henry compelled Pope Pascal to crown him, in April, 1111, but after being excommunicated by successive popes, was compelled to yield in the matter of investiture, and in 1122 subscribed the Concordat of Worms. He was the last of the Salic or Frankish family of emperors, which was succeeded by the Suabian House. He married Matilda, a daughter of Henry I of England.

Henry VI (1165–1197), German Emperor, son of Frederick I and Beatrice of Burgundy. He was crowned king in 1169, and succeeded his father as emperor in 1190.

Henry VII (1262–1313), Emperor of Germany. He was chosen emperor in 1308. He compelled the Milanese to give him the iron crown of Lombardy, suppressed by force the revolt which then broke out in Upper Italy, captured part of Rome, which was in the hands of Neapolitan troops, and was crowned Roman Emperor by two cardinals.



Henry II (1519–1559), King of France, succeeded his father, Francis I, in 1547. Throughout his reign his mistress, Diana of Poitiers, exercised an important influence over king and court. After a brief war with England for the recovery of Boulogne, a war of longer duration and more serious results originated in 1551 in disputes between Henry and the Pope as to the duchies of Parma and Placentia, and continued to devastate Europe till the general peace of Câteau-Cambrésis, 1559.

Henry III (1551–1589), King of France, third son of Henry II and Catherine de' Medici, succeeded his brother, Charles IX, in 1574. In 1576, after a civil war, he granted to the Protestants the favourable Edict of Beaulieu, but the concession led to the formation of the League, and Henry, to re-establish his authority, declared himself its head. Civil war, however, again broke out, and though hostilities were again put an end to by the Peace of Bergerac in 1577, they were renewed in 1580 until the Peace of Fleix (Nov., 1580). Henry III was assassinated by Jacques Clement, a Dominican. He was the last of the branch of Orléans-Angoulême of the stock of the Valois, and was succeeded by Henry of Navarre, the first of the House of Bourbon.

Henry IV (1553–1610), King of France, was the son of Anthony of Bourbon, Duke of Vendôme, and of Jeanne d'Albret, daughter of Henry, King of Navarre, and herself afterwards Queen of Navarre. Educated by his mother in the Calvinistic faith, he early joined, at her wish, the Protestant army of France, and served under Admiral Coligny. In 1576 he put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. On becoming presumptive heir to the crown in 1584, he was obliged to resort to arms to assert his claims. In 1587 he defeated the army of the League at Coutras, and after the death of Henry III gained the battles of Arques (1589) and Ivry (1590). He was convinced that a peaceful occupation of the throne was impossible without his professing the Catholic faith, and became nominally a Catholic in 1593. This step practically ended the opposition to him, and he was able to devote himself to restoring the internal prosperity of his kingdom. In 1598 he granted the Edict of Nantes, which secured

to the Protestants entire religious liberty. Henry was stabbed by a fanatic named Ravallac.

Henry I (1068–1135), King of England, surnamed *Beauclerc* ('fine scholar'), youngest son of William the Conqueror. He succeeded his brother William Rufus in 1100. He re-established by charter the laws of Edward the Confessor, recalled Anselm to the primacy, and married Matilda, daughter of Malcolm III of Scotland, thus conciliating in turn the people, the Church, and the Scots. In 1120 his only son William was drowned in returning from Normandy. Henry appointed as his heir his daughter Matilda or Maud, whom he had married first to the Emperor Henry V, and then to Geoffrey Plantagenet of Anjou. Henry was succeeded by Stephen.

Henry II (1133–1189), King of England, first of the Plantagenet line. He was the son of Geoffrey, Count of Anjou, and Matilda, daughter of Henry I. Invested with the Duchy of Normandy, by the consent of his mother, in 1150, he succeeded to Anjou and Maine in 1151, and by a marriage with Eleanor of Guienne gained Guienne and Poitou. In 1152 he invaded England, but a compromise was effected, by which Stephen was to retain the crown, and Henry to succeed at his death, which took place in 1154. He reigned prosperously till the contest with Thomas Becket (q.v.) regarding the Constitutions of Clarendon. In 1171 he completed the conquest of Ireland, a great part of which had been reduced by Richard de Clare, Earl of Pembroke, commonly known as Strongbow. He ranks among the greatest English kings both in soldiership and state-craft. He partitioned England into four judiciary districts, and appointed itinerant justices to make regular excursions through them; revived trial by jury, discouraged that by combat, and demolished all the newly-erected castles as 'dens of thieves'.

Henry III (1207–1272), King of England, son of John by Isabel of Angoulême, succeeded his father in 1216. As Henry approached to manhood he displayed a character wholly unfit for his station. He discarded his most able minister, Hubert de Burgh, and bestowed his chief favours upon foreigners. His marriage in 1236 with Eleanor of Provence increased the dislike to him felt by his subjects. At length the nobles rose in rebellion under



Simon de Montfort, Earl of Leicester and husband of the king's sister. The king was taken prisoner at a battle fought near Lewes, and a convention, called the *Mise of Lewes*, provided for the future settlement of the kingdom. In 1265 the first genuine House of Commons was summoned. Leicester, however, was defeated and slain in the battle of Evesham (1265), and Henry was replaced upon the throne. His son, Edward I, succeeded him.

**Henry IV (1366-1413)**, King of England, first king of the House of Lancaster. He was the eldest son of John of Gaunt, Duke of Lancaster, fourth son of Edward III. Having in 1398 preferred a charge of treason against Mowbray, Duke of Norfolk, he was banished with his adversary. On the death of John of Gaunt in 1399 Richard withheld Henry's inheritance, and Henry, landing in England, gained possession of Richard's person. The deposition of Richard by Parliament, and the election of Henry, was followed by the murder of the late king. There were many insurrections in this reign, the principal one being that of the Percies and Owen Glendower, whom Henry defeated at Shrewsbury (1403), where Percy was slain. Henry was succeeded by his son Henry V.

**Henry V (1387-1422)**, King of England. On succeeding his father, Henry IV, in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. He revived the claims of his predecessors to the French crown, and accordingly landed near Harfleur in Aug., 1415. A large French army endeavoured to intercept him at the plain of Agincourt, but was completely routed (Oct., 1415). By the Treaty of Troyes (21st May, 1420) Henry engaged to marry the Princess Catherine, and to leave Charles VI in possession of the crown, on condition that it should go to Henry and his heirs at his decease. He died of fever at Vincennes, at the age of thirty-five, and was succeeded by his son, Henry VI.

**Henry VI (1421-1471)**, King of England. As he was an infant not nine months old at the death of his father Henry V, his uncle Humphrey, Duke of Gloucester, was made Protector of the Realm of England. A few weeks after Henry's succession Charles VI of France died, and Henry was proclaimed King of France. The war which followed at first proved favourable

to the English, but in the end, by the heroism of Joan of Arc, the death of the Duke of Bedford, and the defection of the Duke of Burgundy, resulted in the loss to the English of all their possessions in France except Calais. The other noteworthy features of Henry's unhappy reign were the king's insanity, the insurrection of Cade, and the outbreak of the Wars of the Roses. Henry was restored for a few months in 1471 by Warwick, 'the king-maker', but the battles of Barnet and Tewkesbury proved the hopelessness of his cause, and he died, some say was murdered, a few days after the last battle. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose principal claim to remembrance is that he founded Eton College and King's College, Cambridge.

**Henry VII (1456-1509)**, King of England, first sovereign of the Tudor dynasty. He was the son of Edmund, Earl of Richmond, son of Owen Tudor and Catherine of France, widow of Henry V. In 1485 he assembled a small body of troops in Brittany, and, having landed at Milford Haven, defeated Richard III at Bosworth, and was proclaimed king on the field of battle, his right being subsequently recognized by Parliament. In 1486 he married Elizabeth, daughter of Edward IV and heiress of the House of York, and thus united the claims of the rival Houses of York and Lancaster. The reign of Henry VII was troubled by repeated insurrections, of which the chief were that headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487) and Perkin Warbeck (1496-1499). He married his eldest daughter to James IV, King of Scotland, from which marriage there ultimately resulted the union of the two crowns.

**Henry VIII (1491-1547)**, King of England. He succeeded his father, Henry VII, in 1509. He was soon prevailed upon to join in a league formed against Louis XII of France. Some campaigns in France followed, but the success of the English at the Battle of the Spurs (1513) was followed by no adequate result. Meantime, James IV of Scotland was completely defeated and slain at Flodden Field (1513). From 1515 until 1529 the government was practically in the hands of Wolsey. Now came the determination of the king to divorce his wife Catherine. Henry was probably influenced largely by

his attachment to Anne Boleyn, one of the queen's maids of honour. In 1533 his marriage with Catherine was declared null and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the Pope, two Acts of Parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535 declaring Henry the supreme head of the Church. Henry also suppressed the monasteries by Act of Parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavourable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir. The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves. The king's dislike to his wife resulted in another divorce. A marriage with Catherine Howard in 1541 proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catherine Parr, who survived him.

**Henry, O.**, pen-name of William Sydney Porter (1862-1910), American short-story writer and journalist. He wrote numerous short stories, of which some fifteen volumes have been collected. These include: *Rolling Stones*, *The Trimmed Lamp*, and *Cabbages and Kings*.

**Henry of Huntingdon** (twelfth century), English historian. He composed in Latin a general history of England (*Historia Anglorum*, published in the Rolls Series in 1879) from the earliest times down to his own day, the latter part being of considerable value.

**Henryson, Robert** (c. 1425-c. 1500), Scottish poet. He spent most of his life at Dunfermline, where he was schoolmaster. The *Testament of Cresseid*, his most important work, is a continuation of Chaucer's *Troilus and Cresseid*. His best-known poem is the delightful pastoral *Robin and Makyne*. Amongst his other works were a *Tale of Orpheus*, *The Moral Fables of Esop in Scottish Metre*, and an allegorical ballad, *The Bludy Serk*. The earliest extant edition of his *Fables* is that of 1570, and a new edition by Gregory Smith (Scottish Text Society) appeared in 1906.

**Henry the Lion** (1129-1195), Duke of Saxony. He succeeded his father, Henry

the Proud, in 1130, assuming the government of Saxony himself in 1146. At the Diet of princes in Frankfort (1147) he demanded restitution of Bavaria, taken from his father by Conrad VII; but was worsted in the war which followed. It was restored to him, however, in 1154, after the death of Conrad, by the Emperor Frederick, Henry's cousin. His possessions then extended from the Baltic and the North Sea to the Adriatic. In 1174 he followed Frederick I on his fifth expedition to Italy, but left him at the siege of Alessandria. He was then put under the ban of the empire. It was only in 1190, at the close of a year's fighting, that a reconciliation was finally effected. He was much in advance of his age in fostering industry, science, commerce, and the arts.

**Henry the Navigator** (*Don Henrique el Navegador*) (1394-1458), fourth son of King John I of Portugal. He erected at Sagres an observatory and a school of navigation. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea, resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commercial enterprise.

**Henty, George Alfred** (1832-1902), English author. He was for a time connected with the army, and was a war correspondent in several campaigns, but is most widely known as the author of a large number of stimulating stories of adventure, many of them based on historical events. Among his works are: *In the Irish Brigade*, *With Buller in Natal*, *With Roberts to Pretoria*, *With the British Legion*, and *With Kitchener in the Soudan*.

**Henzada**, a district and town of Burma, in the Irrawaddy division. The district has an area of 2870 sq. miles, of which about one quarter is under cultivation. The only crop and practically the only export is rice. The town, situated on the Irrawaddy, is an important trade centre. Pop. (district), 533,000; (town), 25,000.

**Hepar Sulphuris** (literally 'liver of sulphur', so called from its brownish-green and liver-like appearance), a mixture of polysulphides of potassium with sulphate or thiosulphate of potash. It is a common homeopathic medicine.

Simon de Montfort, Earl of Leicester and husband of the king's sister. The king was taken prisoner at a battle fought near Lewes, and a convention, called the *Mise of Lewes*, provided for the future settlement of the kingdom. In 1265 the first genuine House of Commons was summoned. Leicester, however, was defeated and slain in the battle of Evesham (1265), and Henry was replaced upon the throne. His son, Edward I, succeeded him.

**Henry IV (1366-1413)**, King of England, first king of the House of Lancaster. He was the eldest son of John of Gaunt, Duke of Lancaster, fourth son of Edward III. Having in 1398 preferred a charge of treason against Mowbray, Duke of Norfolk, he was banished with his adversary. On the death of John of Gaunt in 1399 Richard withheld Henry's inheritance, and Henry, landing in England, gained possession of Richard's person. The deposition of Richard by Parliament, and the election of Henry, was followed by the murder of the late king. There were many insurrections in this reign, the principal one being that of the Percies and Owen Glendower, whom Henry defeated at Shrewsbury (1403), where Percy was slain. Henry was succeeded by his son Henry V.

**Henry V (1387-1422)**, King of England. On succeeding his father, Henry IV, in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. He revived the claims of his predecessors to the French crown, and accordingly landed near Harfleur in Aug., 1415. A large French army endeavoured to intercept him at the plain of Agincourt, but was completely routed (Oct., 1415). By the Treaty of Troyes (21st May, 1420) Henry engaged to marry the Princess Catherine, and to leave Charles VI in possession of the crown, on condition that it should go to Henry and his heirs at his decease. He died of fever at Vincennes, at the age of thirty-five, and was succeeded by his son, Henry VI.

**Henry VI (1421-1471)**, King of England. As he was an infant not nine months old at the death of his father Henry V, his uncle Humphrey, Duke of Gloucester, was made Protector of the Realm of England. A few weeks after Henry's succession Charles VI of France died, and Henry was proclaimed King of France. The war which followed at first proved favourable

to the English, but in the end, by the heroism of Joan of Arc, the death of the Duke of Bedford, and the defection of the Duke of Burgundy, resulted in the loss to the English of all their possessions in France except Calais. The other noteworthy features of Henry's unhappy reign were the king's insanity, the insurrection of Cade, and the outbreak of the Wars of the Roses. Henry was restored for a few months in 1471 by Warwick, 'the king-maker', but the battles of Barnet and Tewkesbury proved the hopelessness of his cause, and he died, some say was murdered, a few days after the last battle. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose principal claim to remembrance is that he founded Eton College and King's College, Cambridge.

**Henry VII (1456-1509)**, King of England, first sovereign of the Tudor dynasty. He was the son of Edmund, Earl of Richmond, son of Owen Tudor and Catherine of France, widow of Henry V. In 1485 he assembled a small body of troops in Brittany, and, having landed at Milford Haven, defeated Richard III at Bosworth, and was proclaimed king on the field of battle, his right being subsequently recognized by Parliament. In 1486 he married Elizabeth, daughter of Edward IV and heiress of the House of York, and thus united the claims of the rival Houses of York and Lancaster. The reign of Henry VII was troubled by repeated insurrections, of which the chief were that headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487) and Perkin Warbeck (1496-1499). He married his eldest daughter to James IV, King of Scotland, from which marriage there ultimately resulted the union of the two crowns.

**Henry VIII (1491-1547)**, King of England. He succeeded his father, Henry VII, in 1509. He was soon prevailed upon to join in a league formed against Louis XII of France. Some campaigns in France followed, but the success of the English at the Battle of the Spurs (1513) was followed by no adequate result. Meantime, James IV of Scotland was completely defeated and slain at Flodden Field (1513). From 1515 until 1529 the government was practically in the hands of Wolsey. Now came the determination of the king to divorce his wife Catherine. Henry was probably influenced largely by

his attachment to Anne Boleyn, one of the queen's maids of honour. In 1533 his marriage with Catherine was declared null and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the Pope, two Acts of Parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535 declaring Henry the supreme head of the Church. Henry also suppressed the monasteries by Act of Parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavourable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir. The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves. The king's dislike to his wife resulted in another divorce. A marriage with Catherine Howard in 1541 proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catherine Parr, who survived him.

**Henry, O.**, pen-name of William Sydney Porter (1862-1910), American short-story writer and journalist. He wrote numerous short stories, of which some fifteen volumes have been collected. These include: *Rolling Stones*, *The Trimmed Lamp*, and *Cabbages and Kings*.

**Henry of Huntingdon** (twelfth century), English historian. He composed in Latin a general history of England (*Historia Anglorum*, published in the Rolls Series in 1879) from the earliest times down to his own day, the latter part being of considerable value.

**Henryson, Robert** (c. 1425-c. 1500), Scottish poet. He spent most of his life at Dunfermline, where he was schoolmaster. The *Testament of Cresseid*, his most important work, is a continuation of Chaucer's *Troilus and Cresseide*. His best-known poem is the delightful pastoral *Robin and Makyne*. Amongst his other works were a *Tale of Orpheus*, *The Moral Fables of Esop in Scottish Metre*, and an allegorical ballad, *The Bludy Serk*. The earliest extant edition of his *Fables* is that of 1570, and a new edition by Gregory Smith (Scottish Text Society) appeared in 1906.

**Henry the Lion** (1129-1195), Duke of Saxony. He succeeded his father, Henry

the Proud, in 1139, assuming the government of Saxony himself in 1146. At the Diet of princes in Frankfort (1147) he demanded restitution of Bavaria, taken from his father by Conrad VII; but was worsted in the war which followed. It was restored to him, however, in 1154, after the death of Conrad, by the Emperor Frederick, Henry's cousin. His possessions then extended from the Baltic and the North Sea to the Adriatic. In 1174 he followed Frederick I on his fifth expedition to Italy, but left him at the siege of Alessandria. He was then put under the ban of the empire. It was only in 1190, at the close of a year's fighting, that a reconciliation was finally effected. He was much in advance of his age in fostering industry, science, commerce, and the arts.

**Henry the Navigator** (*Don Henrique el Navegador*) (1394-1458), fourth son of King John I of Portugal. He erected at Sagres an observatory and a school of navigation. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea, resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commercial enterprise.

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**Hephæstus**, a Greek god, identified by the Romans with their Vulcanus. He presided over fire, and was the patron of all those who worked in iron and metals. The Cyclopes of Sicily were his workmen and attendants; and with him they fabricated not only the thunderbolts of Zeus, but also arms for the gods and the most celebrated heroes.

**Hera**, a Greek goddess, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn) and Rhea. She was worshipped in all Greece, but her principal seats were at Argos and at Samos. The festivals in her honour were called *Heræa*. The principal were those celebrated every fifth year at Argos, which city was considered to be especially under her protection.

**Heracles**, called by the Romans *Hercules*, the most celebrated hero of Greek mythology, was the son of Zeus (Jupiter) by Alcmena, the wife of Amphitryon. Early in life he had, at the command of Zeus, to subject himself for twelve years to the will of Eurystheus, on the understanding that after he had acquitted himself of this duty he should be reckoned in the number of the gods. He therefore went to Mycenæ, and performed at the bidding of Eurystheus the tasks known as the *twelve labours of Heracles*. These were: (1) to kill a lion which ravaged the country near Mycenæ; (2) to destroy the Lernaean hydra; (3) to capture, alive and unhurt, a stag famous for its incredible swiftness, its golden horns, and brazen feet; (4) to capture alive a wild boar which ravaged the neighbourhood of Erymanthus; (5) to clean the stables of Augæas, where 3000 oxen had been confined for many years; (6) to kill the birds which ravaged the country near the Lake Stymphalus, in Arcadia, and ate human flesh; (7) to bring alive into Peloponnesus a prodigious wild bull, which laid waste the Island of Crete; (8) to obtain the mares of Diomedes, which fed upon human flesh; (9) to obtain from the queen of the Amazons a girdle which she had received from Ares (Mars); (10) to kill the monster Geryon, King of Gades, and bring to Argos his numerous flocks, which fed upon human flesh; (11) to obtain apples from the garden of the Hesperides; (12) the last and most dangerous of all, to bring from the infernal regions the three-headed dog

Cerberus. Heracles's death was caused by his wife Deianira, who gave him a shirt poisoned with the blood of the Centaur Nessus, which she innocently believed would retain for her her husband's love.—*Cf. J. G. Winter, Myth of Hercules at Rome.*

**Heraclion**, the name borne by Crete as a division of Greece. *See Crete.*

**Heraclitus** (c. 540–475 B.C.), Greek philosopher. He left a work *On Nature*, in which he treats also of religion and politics. About 130 genuine fragments of this work remain. He is considered as belonging generally to the Ionic school of philosophers, though he differed from it in important particulars. He considered fire as the first principle of all things. Phenomena exist in a constant state of flux, always tending to assume new forms, and finally returning again to their source. Heraclitus was the profoundest thinker before Plato.

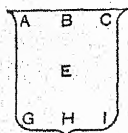
**Heraclius** (c. 575–642), Roman emperor of the East. At the head of a fleet from Carthage, in 610, he assisted in dethroning Phocas, the murderer and successor of the Emperor Mauritius, and himself ascended the throne. In a succession of splendid victories he crushed the Persians under Chosroes; but he made no effort to check the victorious progress of Mahomet. Before his death Syria, Palestine, Mesopotamia, and Egypt had fallen under the dominion of the caliphs.

**Herald**. **Heralds** are appointed in England by the Earl Marshal, who is always the Duke of Norfolk. The **Heralds' College**, or **College of Arms**, founded by charter of Richard III in 1483, consists of the three chief heralds, Garter, Clarenceux, and Norroy Kings of Arms, and the six subordinate or provincial heralds of York, Lancaster, Chester, Windsor, Richmond, and Somerset. There are four marshals or pursuivants, called *Bluemantle*, *Rouge Croix*, *Rouge Dragon*, and *Portcullis*, who usually succeed to vacancies in the **Heralds' College**. Among the duties of the **Heralds' College** are the recording of pedigrees and the granting of coats of arms to persons who wish to assume them. The **Heralds' College**, or **Lyon Court**, in Scotland, consists of *Lyon king-of-arms*, three heralds, *Ross*, *Rothesay*, and *Albany*, and three pursuivants, *Unicorn*, *Carriack*, and *March*.

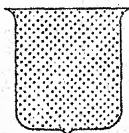
**Heraldry**, the knowledge of the forms, terms, and laws which pertain to the use of armorial bearings or coats of arms.

The origin of heraldic arms, properly so called, is to be attributed to the necessity which arose during the Crusades of distinguishing the leaders of the numerous and motley bands of warriors which constituted the Christian armies. Rolls of arms in England are extant from the reigns of Henry III, Edward I, and Edward II.

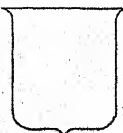
particular names, so that the figures which the field contains may be precisely located. In the accompanying illustration A B C marks the part of the shield called the *chief*, which is the highest and most honourable part of the shield. A is the *dexter chief* or upper right-hand side of the shield; B, the *middle chief*; and C, the



Points of the Shield



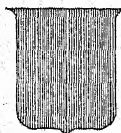
Or



Argent



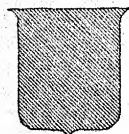
Azure



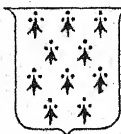
Gules



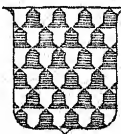
Sable



Vert



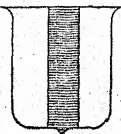
Ermine



Vair



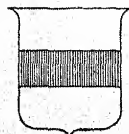
Chief



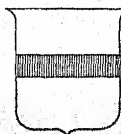
Pale



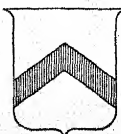
Bend



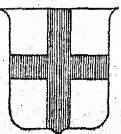
Fesse



Bar



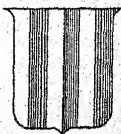
Chevron



Cross



Saltire



Paly



Bendlet



Party per pale



Rampant



Trippant



Volant



Naifant

## Heraldry

The chief courts of jurisdiction in questions of heraldry are the Herald's College in England, and the Lyon Court in Scotland. A coat of arms consists of the figure of a shield marked and coloured in a great variety of ways, so as to be distinctive of an individual, a family, or a community. The shield or *escutcheon* represents the original shield used in war, and on which arms were anciently borne. The surface of the escutcheon is termed the *field*, and the several parts or *points* of it have

*sinister chief* or upper left-hand side of the shield; E, the centre or *fesse point*; G H I, the *base*, that is G, the *dexter* or right-hand base; H, the *middle base*; and I, the *sinister* or left-hand base. Colour is given in the coat of arms by means of *tinctures*, two of which are *metals*—*or* and *argent*, that is, gold and silver—the rest *colours* proper. These colours are, in heraldic terminology; *azure*, blue; *gules*, red; *sable*, black; *vert*, green; *purpure*, purple; *tenney*, orange; *sanguine*, blood-colour. The two last are

comparatively uncommon. An object represented in its natural colours is said to be *proper*. When not given in colours or by actual gilding, the tinctures are represented by points and lines in black and white (see illustration). Another class of tinctures are the *furs*, of which the two principal are *ermine* and *vair*, and which have also their special method of representation. The figures borne on the shield may be either purely artificial and conventional, or may represent real objects, animals, plants, &c. Of the former the most common are known as *ordinaries*, and have the following names: Chief, Pale, Bend, Fesse, Bar, Chevron, Cross, and Saltire (see illustration). *Charges* are the figures of natural and artificial things, and include animals and plants, implements and objects of all sorts, and various imaginary monsters, being drawn either on the field or on one of the ordinaries. It is a rule in heraldry that metal must not be put on metal nor colour on colour; hence, if the field, say, is *argent*, it cannot have a charge or an ordinary tinctured or directly upon it. There are also certain exterior ornaments of the shield or escutcheon, namely, the helmet, mantling, crest, wreath, motto, and supporters. The *full-faced helmet*, with six bars, is for the king and princes of the blood; the *sidelong helmet*, with five bars, is for dukes and marquesses, &c.; the *full-faced helmet of steel*, with its beaver or vizor open, is for knights; and the *sidelong helmet*, with the vizor shut, for the esquire. The crest is placed above the helmet, with the wreath serving as a kind of support; the latter is composed of two colours wreathed or twisted together. The motto consists of the word or phrase carried in a scroll under or above the arms. Supporters were originally only ancient devices or badges, which by custom came to embellish armorial ensigns.—BIBLIOGRAPHY: J. Edmonson, *Complete Body of Heraldry*; G. C. Rothery, *A. B. C. of Heraldry*.

Herat, a city in the north-west of Afghanistan, in a beautiful and fertile plain. It is enclosed by a broad deep moat, and an earthen mound surmounted by a lofty wall of unburned brick, and defended by a strong citadel. The most important manufactures are carpets, sword-blades, shoes, cloaks, and sheepskin caps. The trade, almost entirely in the hands of Hindus, is greatly favoured by the situa-

tion of the town on the great thoroughfare from India westward. Pop. 20,000.

Hérault, a department of France, on the Mediterranean coast; area, 2402 sq. miles. In the north-west it is covered by the Cevennes, but it descends rapidly towards the coast, which is lined by lagoons. The chief rivers, the Hérault, Orb, and Lez, are partly navigable; but the most important water communication is the Canal du Midi. The arable land, about one-sixth of the whole, is generally fertile. The vine and mulberry are extensively, the olive more partially cultivated; fruit is abundant; and aromatic, medicinal, and dye plants are largely grown. Salt is obtained in large quantities. The capital is Montpellier. Pop. (1926), 500,575.

Herbert of Cherbury, Edward Herbert, Lord (1583-1648), English philosopher and historian. At Paris, where he was ambassador, he printed his famous book *De Veritate* (1624), with the object of asserting the sufficiency, universality, and perfection of natural religion. Another work of his was *De Religione Gentilium*. Soon after his death was published his *Life and Reign of Henry VIII.*, and a collection of his poems was published in 1665.

Herbert, George (1593-1633), English poet and divine. His collection of religious poems, *The Temple*, was published in 1633, and the *Jacula Prudentum*, a collection of proverbs, in 1640.

Herberton, a town of Queensland, Australia, 75 miles south-west of Cairns, its port. It is a great tin-mining centre. Copper and wolfram are also found. Pop. 1500.

Hercegovina, a district of the Balkan Peninsula forming with Bosnia a province of the Serb, Croat, and Slovene state (Yugoslavia). The area is 3568 sq. miles (including Bosnia, 19,768) and the population of both is 1,889,929. The surface is mountainous with high forested valleys and fertile plateaux. The chief river is the Narenta, and the capital is Mostar. It produces cereals, tobacco, fruit, and wine. It has considerable but undeveloped mineral wealth. Hercegovina was a Turkish province till 1878, when by the Berlin Congress it was handed over to Austria, being united with Bosnia to form one provincial government. It became Yugoslavian in 1918.

Herculaneum, a city about 5 miles



south-east of Naples, completely buried, with Pompeii, Stabiae, &c., by lava and ashes during an eruption of Vesuvius in the reign of Titus, A.D. 79. The modern villages of Resina and Portici are situated on the present surface. The site had been long sought in vain, when in 1713 three statues were found in digging a well at the village of Portici. At a later date a number of public buildings and private dwellings were laid bare, and many objects of great value discovered, such as statues, busts, beautiful mosaics, wall paintings, charred papyrus manuscripts, &c. Excavations undertaken in 1906 had to be abandoned, owing to the attitude of the Italian Government, and financial difficulties with property-holders in Resina.

**Hercules.** See *Heracles*.

**Hercules, Pillars of**, the ancient name of the two promontories, Calpe (Gibraltar) and Abyla (Ceuta), at the entrance to the Mediterranean.

**Hercules-beetle**, a very large lamelliform tropical beetle, *Dynastes hercules*, with an enormous horn projecting from its head.

**Herder**, Johann Gottfried von (1744–1803), German author. Besides his *Fragments on German Literature*, his *Kritische Wälder* (Critical Woods) and other productions gained him a considerable reputation, and he was appointed in 1771 court preacher, superintendent, and consistorial counsellor at Bükeburg, and in 1776 to the same offices at Weimar. For some time Herder was interested in the poetry of the North, particularly in the poems of Ossian and the works of Shakespeare. As a result he broke with Classicism, and became one of the leaders of the 'Sturm und Drang' movement. As a theologian Herder contributed to a better understanding of the historical and antiquarian part of the Old Testament. His *Geist der Hebräischen Poesie* (Spirit of Hebrew Poetry) is a standard work. He did much also for the better appreciation of the classical authors. His greatest work is his *Ideen zur Philosophie der Geschichte der Menschheit* (Ideas on the Philosophy of the History of Man; 1785 *et seq.*).—Cf. H. W. Nevins, *A Sketch of Herder and his Times*.

**Heredia**, a province and town of Costa Rica, Central America. The surface is mountainous with rich upland pastures and fertile valleys. Cattle are reared and

coffee is grown and exported. The town stands on a plateau 5 miles from San José. Pop. (1927) (district), 38,407; (town), 7631.

**Heredity**, the transmission from parents to offspring of the physical characters and intellectual aptitudes of themselves and their ancestors. The subject is one which has always excited great interest among biologists, and controversy with respect to its problems is at the present day very vigorous.

In man and all those animals that reproduce their kind by means of the congress of the sexes, a new organism originates by the union of a male cell or spermatozoon with a female cell or ovum. Each of these cells contains a number of exceedingly minute bodies which are known as *chromosomes*, from the fact that they display a special avidity for many of the dyes used in staining sections of the tissues for microscopical examination. The material of which the chromosomes are formed is for the same reason called *chromatin*. When an ovum is fertilized, the paternal chromosomes of the spermatozoon are added to the maternal chromosomes of the ovum, so that the body of the offspring that develops contains a mixture of these minute particles, which determine the development of traits of both parental stocks. But before it was recognized how this mosaic of bi-parental characters was conveyed from one generation of living beings to another, the laws regulating the process of admixture had been elucidated by the observations and experiments of the Abbé Mendel, which were published in 1866, but were totally neglected until 1900, when their far-reaching significance was first recognized. Since then a vast amount of experimental breeding of plants and animals has been done by many biologists to confirm and extend the application of the principles laid down by Mendel and to elucidate the mechanism of inheritance. In particular the attempt has been made to bring these results of breeding experiments into correlation with the information independently collected with reference to chromosomes and the part played by them as the bearers of the hereditary qualities. The Mendelian laws of inheritance have been determined by crossing allied races of plants and animals which differ one from the other by some character that is easily recognized, and recording



what happens (and especially the numerical results) in the succeeding generations. See *Mendelism*.

In the process of development of an embryo from a fertilized ovum certain of the cells become specialized in structure and built up into skin, muscle, bone, nerves, glands, &c., of the new being; but some of them retain their primitive characters unaltered and become lodged as guests in the body formed from the other cells. These are the germs of the next generation, the potential ova or spermatozoa from which the children of the hosts of these cells will eventually be formed. Hence the saying that a child is the offspring of its grandparents, seeing that the ovum and spermatozoon from which it was developed were not formed from the tissues of its parents, but merely harboured and protected by them after being formed like the cells of the body itself from the ovum and spermatozoon of a preceding generation. This contrast between body-cells (soma) and germ-cells was emphasized by Weismann, who gave expression to the theory of the continuity of the germ-plasm. The trend of recent research in heredity is to discredit both Weismann's absolute denial of the inheritance of acquired characters and the no less crude interpretation of Lamarck as to the direct influence of environment. Once it is admitted that a special stimulus, either in the environment or in the growth-processes of the individual's own body, is required to call forth the distinctive features of every organism, the way is opened for the recognition of a multitude of factors other than mere continuity of germ-plasm that play a part in moulding the structure of the body and in determining its functional capabilities. The effect of Weismann's teaching was that an altogether undue importance was attached to the influence of heredity in the causation of certain disorders of body and mind, such as tuberculosis and insanity. It cannot be too strongly emphasized that environment and individual experience are as likely to be the primary causes as to be merely contributory causes of these diseases.

During the last quarter of a century a new line of attack on the problems of inheritance has been developed, especially by Professor Karl Pearson and his school of applied statistics at University College, London (see *Eugenics*). By the use of

statistical methods a great deal of constructive work has been done in analysing the data relating to the inheritance of such conditions as albinism and interpreting their significance. Such questions as the hereditary transmission of insanity and the tendency to tuberculosis and the possible effects of alcohol on the descendants of intemperate parents have also been made the subject of prolonged research.—*BIBLIOGRAPHY*: E. B. Wilson, *The Cell in Development and Inheritance*; A. Weismann, *The Germ Plasm: a Theory of Heredity*; R. H. Lock, *Variation, Heredity, and Evolution*; E. W. Macbride, *Introduction to the Study of Heredity*.

**Hereford**, a city and borough of England, capital of the county of same name, on the Wye. It has a beautiful cathedral. The manufactures, which are considerable, consist of gloves, leather, turnery, and nails. The making of cider is important. Pop. (1931), 24,159.

**Herefordshire**, an inland county of England, bordering on Wales, with an area of 538,924 acres, of which about 500,000 are arable, meadow, and pasture. The county belongs wholly to the basin of the Severn, towards which river it has a general slope north to south, as indicated by the course of its rivers, the Wye and its affluents. The soil is in general fertile. Wheat is the principal crop, but barley, oats, beans, pease, hops, and turnips are also extensively cultivated. Orchards are numerous, and a large quantity of excellent cider is made. The Herefordshire cattle are held in high estimation for meat, though they are not good milkers. Horses are bred in considerable numbers. Oak timber is abundant, and forms with oak-bark, an article of export. Pop. (1931), 111,755.

**Herero**, a negroid people inhabiting that portion of the South-West African Protectorate known as Damaraland.

**Herford**, a town of Prussia, in Westphalia, 16 miles south-west of Minden. It has manufactures of linen and cotton goods, leather, basket-work, and tobacco, and oil-mills. Pop. 32,500.

**Heriot**, George (1563–1624), jeweller to King James VI. He left nearly the whole of his fortune to found a school in Edinburgh, styled in the bequest as a "hospital for the maintenance and education of poor fatherless boys, freemen's sons, of the town". The present building known as

Heriot's Hospital was built between 1628 and 1659, and renovated in 1828.

Herisau, a town of Switzerland, in the canton of Appenzell. It has manufactures of muslin and other kinds of cotton goods. Pop. 15,502.

**Heritable and Movable**, in Scots law, a distinction between various kinds of property. Heritable is that which descends to the heir in heritage; movable that which passes to the executor. Under the former term come rights in or connected with land, or all things that go with the land, such as houses, fixed appliances, &c.; under the latter term furniture and other similarly unattached possessions are included.

**Herkomer**, Sir Hubert von (1849-1914), British painter. He first exhibited at the Royal Academy in 1869, and gained great reputation by his pictures *The Last Muster—Sunday at the Royal Hospital, Chelsea; Life, Light, and Melody; Missing: a Scene at the Portsmouth Dockyard Gate; Hard Times; Found; The Chapel of the Charterhouse*; and *On Strike*. His works include many portraits, among them Wagner, Ruskin, and Tennyson.

**Herm**, one of the Channel Islands, 3 miles east of Guernsey,  $1\frac{1}{2}$  miles long by  $\frac{1}{2}$  mile broad. Pop. about 40.

**Hermann**, Johann Gottfried Jakob (1772-1848), German scholar. He originated valuable reforms in the method of Greek grammatical instruction, and is especially known for his editions of *Æschylus*, *Euripides*, *Aristophanes*, *Bion*, and *Moschus*.

**Hermannstadt**, German name of the Romanian town of Sibiu (q.v.).

**Hermas**, one of the so-called Apostolic Fathers. He is known as the author of a work entitled *The Shepherd*. Only a few fragments exist of the Greek original, but the Latin translation, probably made in the second century, and printed in 1513, appears to be complete.

**Hermes**, called by the Romans *Mercurius* (see *Mercury*), in Greek mythology the son of Zeus and Maia. He was the herald and messenger of the gods, and conducted the souls of the departed to the lower world. He was the ideal embodiment of grace, dignity, and persuasiveness, but also of prudence, cunning, fraud, perjury, theft, and robbery. Later writers ascribe to him the invention of dice, music, geometry, letters, &c. He was worshipped in all the cities of Greece, but Arcadia was

the chief place of his worship, his festivals being called *Hermica*.

**Hermes Trismegistus**, a mythical personage, the reputed author of a great variety of works, probably written by Egyptian Neo-Platonists, who ascribed the authorship of the highest attainments of the human mind to Thoth, the Egyptian Hermes, regarding him as the source of all knowledge and inventions, the *Logos* incarnate, thrice greatest (Gr. *tris megistos*). The most important of the extant works is the *Poimandres* or *Poimander* (consisting of fourteen or fifteen chapters), a dialogue on nature, the creation, the deity, the soul, knowledge, and similar topics.

**Hermit-crab**, a name common to a family (Paguridae) of well-known decapod crustaceans. These crabs occupy shells which they change for larger ones to suit their growth. The most common British species is the *Pagurus Bernhardus*, popularly known as the soldier-crab. See *Plate, British Crustacea*.

**Hermit Islands**, a group of 17 small islands off the east coast of New Guinea. Formerly German, they were annexed by Britain in 1914. They are densely wooded. Pop. 500.

**Hermon**, a mountain of Syria, belonging to the Anti-Lebanon, about 9400 feet high.

**Hermopolis**, a seaport of Greece, on the Island of Syros, department of Cyclades. It has a good harbour, carries on ship-building and the manufacture of 'Turkish Delight', cottons, flour, and glass. It exports sponges, emery, and tobacco. Pop. (1928), 21,156.

**Hermosillo**, capital of the state of Sonora, Mexico, on the River Sonora, 110 miles north from the port of Guaymas, with which it has a large traffic. It has a mint, distilleries, and flour-mills. Pop. 14,600.

**Herne Bay**, an English watering-place on the north coast of Kent. Pop. (1931), 11,244.

**Hernia**, in surgery, a tumour formed by the displacement of a soft part in any part of the body. But the term is ordinarily applied to abdominal hernia. Most of the viscera, when displaced, push the peritoneum forward before them: this membrane thus forms an envelope of the hernia, which is called the *hernial sac*. The hernia itself is usually a loop of the small bowel, and though it has been pushed through the wall of the abdomen,

forming a tumour under the skin, the feces still pass along it. If the hernia can be returned to the abdomen, it is said to be reducible; if, from its size or other cause, it cannot be replaced, it is irreducible. A hernia, when reduced, is prevented from recurring by means of a pad or truss. An irreducible hernia must be supported with great care. A hernia is said to be strangulated when it is not only irreducible, but also subjected to a continual constriction, which interferes with the circulation through the blood-vessels of the part and the passage of the feces.

**Hernösand**, a seaport and cathedral town of Sweden, capital of Västernorrland, on the Island of Hernö, in the Gulf of Bothnia, with a considerable shipping trade. Vessels of any size can enter the harbour, which is one of the best in Sweden. There is a dry-dock (410 feet). Timber, pulp, and cellulose are exported. Pop. 9785.

**Herod**, a Greek priestess of Aphrodite at Sestos, for love of whom Leander, a youth of Abydos, swam every night across the Hellespont, guided by a torch from her tower. One stormy night the torch was blown out, Leander drowned, and his body washed ashore, when Hero, overcome with anguish, threw herself from the tower. There is a Greek poem by Musæus on this subject.

**Hero of Alexandria** (c. A.D. 50–100), Greek mathematician. A common pneumatic toy, called Hero's fountain, is attributed to him, and he also invented the æolipile, and a heliostat.

**Herod**, called *the Great* (c. 74–4 B.C.), King of the Jews. He was the second son of Antipater the Idumean, who, being made Procurator of Judea by Julius Caesar, appointed Herod to the government of Galilee. He at first embraced the party of Brutus and Cassius, but after their death reconciled himself to Antony, by whose interest he was first named Tetrarch, and afterwards King of Judea. After the battle of Actium he successfully paid court to Augustus, who confirmed him in his kingdom. He rebuilt the temple at Jerusalem with great magnificence, and constructed many strong fortresses throughout Judea, the principal termed Cesarea, after the emperor. The birth of Jesus Christ is said to have taken place in the last year of the reign of Herod.

**Herod Agrippa I** (d. A.D. 44), son of Aristobulus by Berenice, daughter of Herod the Great. To please the Jews, with whom his rule was very popular, he caused St. James to be put to death, and imprisoned St. Peter. He died in the circumstances related in *Acts*, xii.

**Herod Agrippa II** (d. A.D. 94), son of the preceding, and last of the Herodian line. He received the Kingdom of Chalcis, and obtained the superintendency of the temple at Jerusalem, where, with his sister Berenice, he heard the defence of Paul before Festus. Being driven from Jerusalem by the revolt of the Jews, he joined Cestius, and later on Vespasian, and during the siege of Jerusalem was very serviceable to Titus.

**Herod Antipas**, son of Herod the Great by the Samaritan Malthace, was appointed Tetrarch of Galilee on his father's death (4 B.C.). This was the Herod who put to death St. John the Baptist, in compliment to his wife Herodias and in revenge for his reproaches of their incestuous union.

**Herodas**, or **Herondas** (third century B.C.), Greek writer of mimes. Very little was known about Herodas (even the exact form of his name is uncertain) until 1890, when Sir F. G. Kenyon found at Fayum, in Egypt, a papyrus containing seven mimes in a practically perfect condition, and some fragments. These mimes are written in the old Ionic dialect, though the structure of the sentences is Attic. The metre is the curious *seazon* or limping iambic metre, with a spondee instead of an iambus in the last foot. Herodas is an unqualified realist, and gives us much information about the manners and customs of his time. He is not a great writer, but is extremely clever and amusing. The mimes are full of delicate touches of humour—humour which is none the worse for being unobtrusive. In general tone they are not unlike Mr. F. Anstey's *Voces Populi*. There is an excellent edition by Walter Headlam and A. D. Knox, who, as the Spanish proverb has it, have left nothing in their inkpot.

**Herodotus** (c. 484–425 B.C.), Greek historian. Before writing his history he travelled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon and Ecbatana, Egypt as far as Elephantine and other parts of Northern Africa, everywhere investigating the manners, customs, and



religion of the people, the history of the country, and the productions of the soil. The history is divided into nine books, each bearing the name of a muse, and is written in the Ionic dialect. The object of the historian is to narrate the conflict between the Greeks and Persians, and he traces the enmity of the two races back to mythical times. Rapidly passing over the mythical period, he comes to Croesus, King of Lydia, of whom and of his kingdom he gives a comparatively full history. The conquest of Lydia by Cyrus induces him to relate the rise of the Persian monarchy and the subjugation of Asia Minor and Babylon. The history of Cambyse and his Egyptian expedition leads him to introduce the valuable details of the history, geography, and manners and customs of Egypt, which occupy the second book. The Scythian expedition of Darius causes the historian to treat of the Scythians and the north of Europe; and the subsequent extension of the Persian kingdom affords him the opportunity for giving an account of Cyrene and Libya. In the meantime the revolt of the Ionians breaks out, which eventually brings on the conflict between Greece and Persia. An account of this outbreak and of the rise of Athens, after the expulsion of the Peisistratidae, is followed by what properly constitutes the principal part of the work, and the history of the Persian War now runs on in an uninterrupted stream until the taking of Sestos. The English translation by Rawlinson has important notes and dissertations.—Cf. J. B. Bury, *Ancient Greek Historians*.

**Héroid**, Louis Joseph Ferdinand (1791–1833), French musical composer. His first successful opera was *Les Rosières*, produced in 1817. This was followed by, among other minor compositions, *Le Muletier* (1823) and *Marie* (1826). His chief works, however, are the famous *Zampa* (1821) and *Le Pré aux Clercs* (1832).

**Heron**, birds of the genus *Ardea*, constituting with the bitterns and shoe-bills the family Ardeidae. They are distinguished by having a long bill cleft beneath the eyes, a compressed body, long slender legs, and moderate wings. The common heron (*Ardea cinerea*) is about 3 feet in length, and often builds in groups in high trees. It is a very greedy bird, and spends most of its life eating or hunting for food. Its haunts are streams, marshes, ponds, and

lakes, as also the seashore. When falconry was a popular pastime herons were the special quarry of the larger hawks. Other members of the family are the great blue heron of America, the great white heron or egret of Europe, and the green heron of North America. See Plate, *British Birds*.

**Herpes** is a skin disease and takes the form of an acute eruption of vesicles occurring on the lips, nostrils, or other parts of the face, and in these situations is known as *Herpes simplex*. It also occurs on the genital regions, buttocks, nipples, and mucous surfaces, but is rarely seen in other regions. It may occur alone, but is a common accompaniment of much more serious conditions, as pneumonia or cerebro-spinal meningitis. *Herpes zoster* is another name for shingles (q.v.).

**Herrera**, Francisco de (1576–1656), Spanish historical painter. His design and handling are spirited and vigorous, and he may be regarded as to some extent the founder of a new national school. Among his pupils was Velasquez.—His youngest son, Francisco, surnamed *El Mozo* (1622–1685), became court painter to Philip IV.

**Herrera**, a province of Panama, Central America, capital Chitré. Pop. 28,984.

**Herrick**, Robert (1591–1674), English poet. He was educated at Westminster, and at St. John's College and Trinity Hall, Cambridge. He took his B.A. degree in 1617 and his M.A. in 1620. In 1629 he was presented to the living of Dean Prior, a lonely place in Devonshire. Herrick was a sturdy Royalist, and accordingly was evicted in 1648 to make way for one Dr. John Symes, a Puritan. In 1648 he published his only volume of poems, entitled *Hesperides, or the Works both Human and Divine of Robert Herrick*. He had the satisfaction of ousting Dr. Symes from Dean Prior in 1662. Little is known of the last twelve years of his life.

There are few poets more charming than Herrick, and few who lend themselves less to critical disquisitions. His work is all self-explanatory, and beautifully lucid. He was an enthusiastic admirer of the Greeks and Romans, and imitated their manner as well as their matter. Some of his poems do not merely remind us of Horace; they place him within a measurable distance of Catullus. Yet Herrick, in spite of many reminiscences of the ancients, is essentially original. Everything that he borrowed he made his own. He was the most celebrated



of the 'sons' of Jonson, but he had nothing to learn from his master. Herrick with consummate ease could reach heights to which Jonson's care and toil could never attain. It is not without significance that Jonson when young was apprenticed to a bricklayer, while Herrick was apprenticed to a jeweller. Herrick's spontaneity, however, is deceptive. Close scrutiny can detect traces of careful workmanship even in those pieces which seem most unpremeditated. He was a perfect master of metre, and experimented with many new forms of it, nearly always successfully. In his poems of country life he shows himself a true lover of nature, and though born in Cheap-side, as much a Devon man as Blackmore. In his love poems he is charming and dainty. In his fairy poems he shows himself the poet-laureate of the court of Oberon and Titania. In his *Noble Numbers* he shows that he could write songs of good life as well as love-songs. They sustain his reputation as a clergyman more than his reputation as a poet. In his nature he was a curious mixture of pagan and Christian, the pagan element predominating. The essence of his philosophy is to be found in Horace's famous phrase "Carpe diem" or his own "Gather ye rosebuds while ye may". Among all the Cavalier lyrists Herrick reigns as king by the indefeasible right of his daintiness and charm.—BIBLIOGRAPHY: Floris Delattre, *Robert Herrick*; F. W. Moorman, *Robert Herrick: a Biographical and Critical Study*.

**Herring**, the general name of fishes of the genus *Clupea*, the most important of which is the *Clupea harengus*, or common herring. It is of wide distribution in the North Atlantic, 45° n. lat. being about the southern limit. It measures from 10 to 12 inches in length, with blue-green back and brilliant silvery white under parts. It has small teeth in both jaws. Herrings swim near the surface, and are therefore easily taken by net. There are two races, winter and summer, named from the spawning season. Winter herring are taken in the Firth of Forth, on the Ballantrae Banks, and off Plymouth. In Scotland the regular fishing begins in May at the Hebrides, in July on the northern coasts, and during August, September, and October along the east coasts of Scotland and England. The mode of fishing most common to Scotland is with the drift-net. Trawling or seine-net fishing is also practised. In

Scotland the catch of herrings is generally measured by the 'cran' = 45 gallons; a large proportion are cured or pickled, but great quantities are also disposed of fresh. There are upwards of 6000 boats engaged in the Scottish fishery, with an aggregate of 120,000,000 sq. yards of netting. The annual value of herrings cured in Scotland is usually over £2,800,000. Other prominent members of the herring family (*Clupeidae*) are the sprat or garvie (*Clupea sprattus*); the pilchard or gypsy herring (*C. pilchardus*), of which the young are the true sardine; the anchovy (*Engraulis encrasicolus*). Whitebait chiefly consists of the fry of herrings and sprats.

**Herschel**, Caroline Lucretia (1750-1848), English astronomer, sister of Sir William Herschel. She joined her brother at Bath in 1771, and acted during his life as his astronomical assistant.

**Herschel**, Sir John Frederick William (1792-1871), English astronomer, only son of Sir William Herschel. In 1813 he graduated B.A. at Cambridge, and was Senior Wrangler and Smith's Prizeman. After his father's death he spent eight years reviewing the nebulae and clusters of stars discovered by his father. The results were given in 1833 to the Royal Society in the form of a catalogue of stars. The catalogue contained observations on 525 nebulae and clusters of stars not noticed by his father, and on a great number of double stars, between 3000 and 4000 in all. In 1830 he produced his excellent *Preliminary Discourse on the Study of Natural Philosophy*. In 1847 he published *Results of Astronomical Observations made during 1834-1838 at the Cape of Good Hope*. He was one of the earliest pioneers in photography.—Cf. A. M. Clerke, *The Herschels and Modern Astronomy*.

**Herschel**, Sir William (1738-1822), English astronomer. Late in 1779 he began a regular survey of the heavens, star by star, with a 7-foot reflector, and discovered, 13th March, 1781, a new primary planet, named by him the *Georgium Sidus*, but now known as *Uranus*. He also measured the rotation of Saturn, discovered two of its satellites, and observed the phenomena of its rings. At Slough, near Windsor, he erected a telescope of 40 feet length, and completed it in 1787. In 1802 he laid before the Royal Society a catalogue of 5000 nebulae and clusters of stars which he had discovered.—Cf. J. L. E. Dreyer, *A Short*

*Account of Sir William Herschel's Life and Works.*

**Herstal**, or **Heristal**, a town of Belgium, on the Meuse, 3 miles north-east of Liège. It has great iron and steel industries, the principal manufactures being bicycles and fire-arms. Pop. 22,910.

**Hertford**, a borough of England, capital of the county of same name, on the Lea. There are breweries and oil- and flour-mills. The castle, which was built by Edward the Elder about A.D. 905, was at various times the residence or place of captivity of royalty. Pop. (1931), 11,376.

**Hertford** (contracted **Herts**), English county, is bounded by Cambridgeshire, Essex, Middlesex, Buckingham, and Bedford; area, 404,523 acres, of which about five-sixths are arable, meadow, and pasture. The surface is diversified by hill and valley, pasture lands, arable farms, and picturesque parks and woods. The principal rivers are the Lea and Colne, both of which have numerous tributaries. Agriculture employs a large number of the inhabitants; there are manufactures of paper, silk, and straw. Pop. (1931), 401,159.

**Hertling**, Georg Friedrich von (1843-1919), German politician. He became President of the Council and Minister of Foreign Affairs in Bavaria in 1911, but laboured for the supremacy of Prussia. William II appointed him Imperial Chancellor in Nov., 1917, in succession to Michaelis, but he resigned ten months later without having accomplished anything.

's **Hertogenbosch**, capital of North Brabant, Holland, 30 miles S.S.E. of Utrecht. It has breweries, distilleries, and manufactures of cutlery and glass. A canal links it with Maastricht and other places. Pop. 39,963.

**Hertz**, Heinrich Rudolf (1857-1894), German physicist. His work in dynamics is important, but his great achievement was the discovery of Hertzian waves (q.v.).

**Hertz**, Henrik (1798-1870), Danish dramatic poet. Among his plays are: *Sparekassen*; *Ninon*; *Svend Dyrings Hus*, a tragedy founded on an old saga; and *King René's Daughter*.

**Hertzian Waves**, ether waves predicted by Clerk Maxwell in 1864 and demonstrated by Hertz in 1888. Hertz showed that these waves could be reflected from metal surfaces, bent out of their course by

means of a prism made of pitch, and he found that the waves could pass through stone walls and wooden floors. They differ from light waves in having a much greater wave-length. See *Wireless Telegraphy*.—**BIBLIOGRAPHY**: H. Hertz, *Electric Waves*, translated by D. E. Jones; S. P. Thompson, *Light, Visible and Invisible*.

**Hertzog**, James Barry Munnik (1866- ), Dutch South African politician. He served as a Boer general in the Boer War (1899-1902), and afterwards opposed the moderate party headed by Smuts and Botha. He was Attorney-General and Minister of Education to the Orange River Colony in 1907, and first Minister of Justice to the Union of South Africa (1910-1912). He became leader of the Nationalist party, opposed South African co-operation in the European War, and in 1924 became Prime Minister with a joint Nationalist and Labour Cabinet.

**Hervey Islands**, name given to Manuae and Te Au o Tu in the Cook Islands.

**Herzl**, Theodor (1860-1904), Jewish politician. He was in Paris from 1891 to 1895, and moved, no doubt, by the Dreyfus affair, he published his *Judenstaat* (The Jewish State), wherein he advocated the restoration of the Jewish national home as the only remedy against the sufferings of the Jews, and the only way of liberating the Jewish nationality as such. Henceforth he devoted his energy and activities to the propaganda of Zionism. See *Zionism*.

**Hesiod** (eighth century B.C.), the father of Greek didactic poetry. Little is known of his life beyond what he tells us himself. The poems of Hesiod belong to the Boeotian school of poetry. This school arose partly in opposition to Homer, though the influence of Homer is apparent in all the Hesiodic poems. Homer wrote to please the imagination, Hesiod wrote to instruct. He is strictly utilitarian in all his writings. By far the most important and interesting of them, and the only one which the Boeotians acknowledged as genuine, is the *Works and Days*. This poem contains many well-known passages, such as the story of Pandora and her jar, the account of the five ages of the world, the fable of the hawk and the nightingale, and the descriptions of winter and summer. *The Theogony* is a much less interesting poem. It is an attempt to systematize mythology, and might be called a sort of Olympian Peerage. It gives an account

of the creation, a history of Zeus and Cronos, and a list of women who married gods. Its best passages are those which deal with the war between the gods and Titans. *The Shield of Heracles* is, in the main, simply a description of that article. Hesiod is not a great poet; he rarely attains to anything that could be called sublimity, but he is none the less an interesting and important figure in Greek literary history. He takes a naïve and child-like interest in everything that happens in nature, especially when it concerns himself. His chief poem embodies much of the proverbial philosophy of early Greece. Much of it is probably founded upon traditional peasant poetry of Bœotia, maxims simply put into verse for the sake of convenience in remembering, and no more intrinsically poetry than "Thirty days hath September". Hesiod is of the greatest value to students of the manners and customs of the eighth century B.C.; from a purely literary point of view the chief value of his works is that they inspired Virgil to write the *Georgics*. There is a translation by H. G. Evelyn-White (Loeb Library).

**Hesperides**, in Greek mythology, certain nymphs who were the guardians of the golden apples that grew in the gardens of the Hesperides. It was the eleventh labour of Heracles to bring the golden apples of the Hesperides to Eurystheus.

**Hesse**, anciently a territory of Germany, situated mainly between the Rivers Neckar, Rhine, Main, Lahn, and Fulda. It became divided into Hesse-Cassel and Hesse-Darmstadt, the latter being generally known as Hesse. See following articles.

**Hesse**, a republic of Germany, until 1918 a grand-duchy. It was formerly known as *Hesse-Darmstadt*. Of the two main portions, one (the provinces of Rheinhessen and Starkenburg) lies immediately to the north of Baden; the other, Oberhessen (Upper Hesse), is entirely enclosed by the Prussian province of Hesse-Nassau; area of the whole state, 2968 sq. miles. Oberhessen is generally mountainous; the provinces Starkenburg and Rheinhessen are also mountainous towards their frontiers, but there are extensive plains belonging to the valleys of the Main and the Rhine. Much of the soil, particularly in the provinces of Starkenburg and Rheinhessen, is remarkably fertile. The vine forms a most important

object of culture, and fruit is very abundant. Coal and iron-stone are mined, and there are manufactures of leather, cloth, paper, furniture, &c. The principal towns are Darmstadt, the capital; Mainz, Offenbach, Worms, and Giessen. About two-thirds of the inhabitants are Protestants. Pop. (1925), 1,347,279. The former Grand-Duchy of Hesse originated in the division of the Landgraviate of Hesse in 1567. In 1806 the Landgraviate was erected into a grand-duchy with an enlarged territory by Napoleon. It was reduced to its present limits in 1866. Hesse was proclaimed a republic in Nov., 1918, and the new Constitution was adopted in Jan., 1919.

**Hesse-Cassel**, a district of Germany, formerly an independent Electorate, containing 4430 sq. miles, but now, with the exception of several small strips of territory, forming part of the Prussian province of Hesse-Nassau. It was founded in 1567. On the outbreak of the German War of 1866, the Elector declared himself on the side of Austria, and his territory was occupied by Prussian troops. On the conclusion of the war Hesse-Cassel was annexed to the Prussian territories.

**Hesse-Darmstadt**. See *Hesse*.

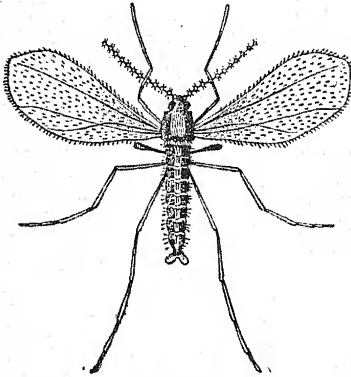
**Hesse-Homburg**, before its absorption by Prussia after the German War of 1866, a Landgraviate of Germany.

**Hesse-Nassau**, a province of Prussia, formed out of the former Principality of Hesse-Cassel, the Duchy of Nassau, the Landgraviate of Hesse-Homburg, the territory and town of Frankfurt, &c. It encloses Upper Hesse. The boundary is partly formed by the Rhine, Main, Weser, and Werra. Other rivers are the Lahn and Fulda. The greater part of this province belongs to the Central German Plateau, and has a rugged surface, partly covered by branches of the Harz. About 40 per cent of the whole is arable, while about the same is under wood. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woollens, cottons, and linen. The principal towns are Cassel, the capital, Wiesbaden, and Frankfurt. Its area is 6063 sq. miles, and its pop. (1925), 2,396,871.

**Hessian**, known in America as *burlap*, a jute fabric at one time made from flax and tow, used extensively for packing, bag-making, cheap clothing, and in the manufacture of linoleum and upholstery. There are many varieties all of which are made

at Dundee. Calcutta is another centre of its manufacture.

**Hessian Fly** (*Cecidomyia destructor*), a fly of the family Tipulidæ, of the order Diptera (two-winged flies), the larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats). The female fly is about an eighth of an inch in length, with a wing expanse of



Hessian Fly (much enlarged)

about a quarter of an inch. Its body is brown, and the wings a dusky grey. The male is somewhat smaller than the female and has longer antennæ. The female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These maggots turn to pupæ, from which the flies develop in about ten days. It did not appear in Britain till the summer of 1886.

**Heterogamous Plants**, those in which the male and female gametes differ from one another, sometimes only in size, but more often also in structure. See *Generations*, *Alternation of*.

**Heteropoda**, a group of marine sea-snails, the most highly organized of the Gasteropoda. They swim in an upside-down position. Typical genera are *Atlanta* (spiral shell), *Carinaria* (cap-shaped shell), and *Pterotrachæa* (no shell). The foot is so compressed that it serves for a fin.

**Heteroptera**. See *Hemiptera*.

**Heterostyly**, or **Heterostylism**, in flowers, a condition seen in its typical form in the primrose and other species of

*Primula*. Two kinds of flowers are found, each on a separate plant, distinguished by the relative lengths of stamens and styles.

**Hetton**, a parish of Durham, England, with coal-mines. Pop. (1931), 17,672.

**Hevea**. See *Rubber*.

**Hewart**, Gordon Hewart, first Baron (1870– ), British lawyer and politician. He was called to the Bar in 1902, was Solicitor-General from 1916 to 1919 and Attorney-General from 1919 to 1922, when he became Lord Chief Justice.

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of the creation, a history of Zeus and Cronos, and a list of women who married gods. Its best passages are those which deal with the war between the gods and Titans. *The Shield of Heracles* is, in the main, simply a description of that article. Hesiod is not a great poet; he rarely attains to anything that could be called sublimity, but he is none the less an interesting and important figure in Greek literary history. He takes a naïve and child-like interest in everything that happens in nature, especially when it concerns himself. His chief poem embodies much of the proverbial philosophy of early Greece. Much of it is probably founded upon traditional peasant poetry of Boeotia, maxims simply put into verse for the sake of convenience in remembering, and no more intrinsically poetry than "Thirty days hath September". Hesiod is of the greatest value to students of the manners and customs of the eighth century B.C.; from a purely literary point of view the chief value of his works is that they inspired Virgil to write the *Georgics*. There is a translation by H. G. Evelyn-White (Loeb Library).

**Hesperides**, in Greek mythology, certain nymphs who were the guardians of the golden apples that grew in the gardens of the Hesperides. It was the eleventh labour of Heracles to bring the golden apples of the Hesperides to Eurystheus.

**Hesse**, anciently a territory of Germany, situated mainly between the Rivers Neckar, Rhine, Main, Lahn, and Fulda. It became divided into Hesse-Cassel and Hesse-Darmstadt, the latter being generally known as Hesse. See following articles.

**Hesse**, a republic of Germany, until 1918 a grand-duchy. It was formerly known as *Hesse-Darmstadt*. Of the two main portions, one (the provinces of Rheinhessen and Starkenburg) lies immediately to the north of Baden; the other, Oberhessen (Upper Hesse), is entirely enclosed by the Prussian province of Hesse-Nassau; area of the whole state, 2968 sq. miles. Oberhessen is generally mountainous; the provinces Starkenburg and Rheinhessen are also mountainous towards their frontiers, but there are extensive plains belonging to the valleys of the Main and the Rhine. Much of the soil, particularly in the provinces of Starkenburg and Rheinhessen, is remarkably fertile. The vine forms a most important

object of culture, and fruit is very abundant. Coal and iron-stone are mined, and there are manufactures of leather, cloth, paper, furniture, &c. The principal towns are Darmstadt, the capital; Mainz, Offenbach, Worms, and Giessen. About two-thirds of the inhabitants are Protestants. Pop. (1925), 1,347,279. The former Grand-Duchy of Hesse originated in the division of the Landgraviate of Hesse in 1567. In 1806 the Landgraviate was erected into a grand-duchy with an enlarged territory by Napoleon. It was reduced to its present limits in 1866. Hesse was proclaimed a republic in Nov., 1918, and the new Constitution was adopted in Jan., 1919.

**Hesse-Cassel**, a district of Germany, formerly an independent Electorate, containing 4430 sq. miles, but now, with the exception of several small strips of territory, forming part of the Prussian province of Hesse-Nassau. It was founded in 1567. On the outbreak of the German War of 1866, the Elector declared himself on the side of Austria, and his territory was occupied by Prussian troops. On the conclusion of the war Hesse-Cassel was annexed to the Prussian territories.

**Hesse-Darmstadt**. See *Hesse*.

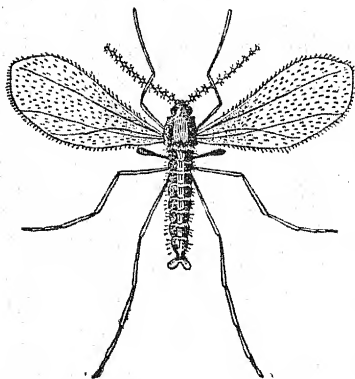
**Hesse-Homburg**, before its absorption by Prussia after the German War of 1866, a Landgraviate of Germany.

**Hesse-Nassau**, a province of Prussia, formed out of the former Principality of Hesse-Cassel, the Duchy of Nassau, the Landgraviate of Hesse-Homburg, the territory and town of Frankfurt, &c. It encloses Upper Hesse. The boundary is partly formed by the Rhine, Main, Weser, and Werra. Other rivers are the Lahn and Fulda. The greater part of this province belongs to the Central German Plateau, and has a rugged surface, partly covered by branches of the Harz. About 40 per cent of the whole is arable, while about the same is under wood. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woollens, cottons, and linen. The principal towns are Cassel, the capital, Wiesbaden, and Frankfurt. Its area is 6063 sq. miles, and its pop. (1925), 2,396,871.

**Hessian**, known in America as *burlap*, a jute fabric at one time made from flax and tow, used extensively for packing, bag-making, cheap clothing, and in the manufacture of linoleum and upholstery. There are many varieties all of which are made

at Dundee. Calcutta is another centre of its manufacture.

**Hessian Fly** (*Cecidomyia destructor*), a fly of the family Tipulidæ, of the order Diptera (two-winged flies), the larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats). The female fly is about an eighth of an inch in length, with a wing expanse of



Hessian Fly (much enlarged)

about a quarter of an inch. Its body is brown, and the wings a dusky grey. The male is somewhat smaller than the female and has longer antennæ. The female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These maggots turn to pupæ, from which the flies develop in about ten days. It did not appear in Britain till the summer of 1886.

**Heterogamous Plants**, those in which the male and female gametes differ from one another, sometimes only in size, but more often also in structure. See *Generations*, *Alternation of*.

**Heteropoda**, a group of marine sea-snails, the most highly organized of the Gasteropoda. They swim in an upside-down position. Typical genera are *Atlanta* (spiral shell), *Carinaria* (cap-shaped shell), and *Pterotrachaea* (no shell). The foot is so compressed that it serves for a fin.

**Heteroptera**. See *Hemiptera*.

**Heterostyly**, or *Heterostylism*, in flowers, a condition seen in its typical form in the primrose and other species of

*Primula*. Two kinds of flowers are found, each on a separate plant, distinguished by the relative lengths of stamens and styles.

**Hetton**, a parish of Durham, England, with coal-mines. Pop. (1931), 17,672.

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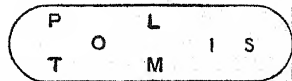
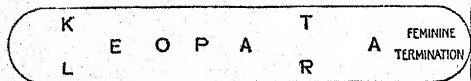
between the Pardoner and the Frere, the Curate and Neybour Pratte; The Play of Love; The Four P's; &c.

Heywood, Thomas (c. 1575–1650), English dramatist. He said of himself that he had "either an entire hand or at least a main finger" in two hundred and twenty plays. Of these only about twenty-four remain. He is said to have written his plays on the backs of tavern-bills, which would account for the loss of many of them, and to have demanded from himself a daily ration of so many words. He particularly excelled in domestic drama—in plays which dealt not with kings and dukes on the one hand, nor with low life and the vagaries of the mob on the other, but with middle-class life and every-

Hickory, the name given to several species of timber trees of the genus *Carya*, belonging to the nat. ord. Juglandaceæ (walnut), natives of North America. The wood is heavy, strong, and tenacious, and is used for making carriage-shafts, screws, whip-handles, cogged wheels, &c.

Hidalgo, a state of Mexico. The area is 8637 sq. miles. It is part of the great central plateau and has some very fertile areas. The main agricultural products are cereals, coffee, tobacco, sugar-cane, and cotton. Silver and iron ore are mined, and *pulque*, the national drink, is made from the agave. The capital is Pachuca. Pop. (1921), 622,241.

Hierapolis, a ruined city of Asia Minor, 121 miles east by south of Smyrna.



Cartouche of Cleopatra

Cartouche of Ptolemaios, i.e. Ptolemy

day happenings. His masterpiece is *A Woman Killed with Kindness*—a painful but masterly play. His other plays include: *Edward IV*; *The Four Prentices of London*, an historical farrago; *The Rape of Lucrece*, a play which is almost a tragic opera, but with ill-written lyrics; and *The Fair Maid of the West*, an extravagant but lively play.—Cf. A. C. Swinburne, *The Age of Shakespeare*.

Heywood, a borough of England, in Lancashire, about 8 miles north-west of Manchester. The making of power-looms, iron- and brass-founding, boiler-making, and all branches of cotton-spinning and manufacturing, with other industries, are extensively carried on. Pop. (1931), 25,967.

Hibernation. See *Dormant State*.

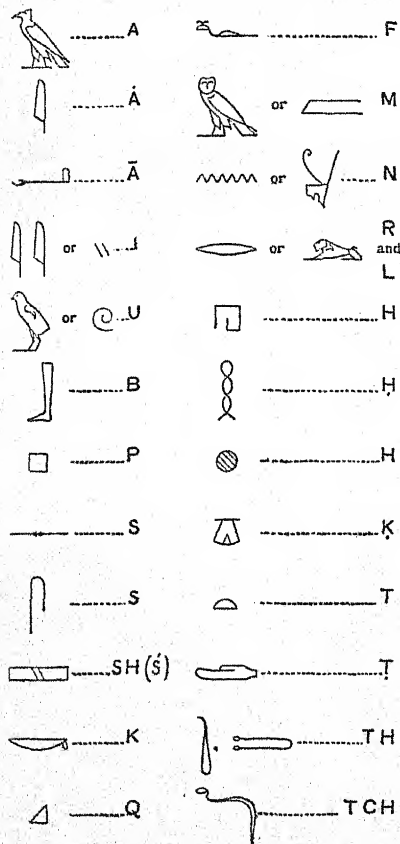
Hibiscus, an extensive genus of plants, nat. ord. Malvaceæ (mallows), chiefly natives of tropical climates. They are chiefly shrubs with large showy flowers, a few attaining the dimension of trees. The fibre of their bark is used commercially. *Althæa frutescens* is a species of hibiscus (*H. syriacus*).

Hiero I (d. 467 B.C.), ruler of Syracuse, in Sicily, brother of Gelon, whom he succeeded in 478 B.C. He was an enlightened ruler, and a patron of genius and learning. His court became the rendezvous of the most distinguished writers of his time, including Pindar, Æschylus, Bacchylides, Epicharmus, and Simonides.

Hiero II (d. 216 B.C.), ruler of Syracuse. He was chosen by the soldiers as general in 275 B.C., and recognized as king about 270. His subjects enjoyed great prosperity during his reign. Hiero devoted himself to the construction of military machines of all kinds, and ships of great size, under the direction of Archimedes.

Hieroglyphics. Three different modes of writing were used by the ancient Egyptians, the *Hieroglyphic*, the *Hieratic*, and the *Demotic*. Pure hieroglyphic writing is the earliest, and consists of figures of natural objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the hieratic or priestly writing, the form in which most Egyptian literature is

written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B.C. are extant. In the demotic or *enchorial* writing, a very cursive form



Hieroglyphics. The Egyptian Alphabet

(By permission of Sir E. A. Wallis Budge.)

(the ancient 'running hand'), derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the ninth century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the eighteenth century scholars failed to find a clue to the hieroglyphic writings.

In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a trilingual inscription in hieroglyphics, demotic characters, and Greek, which turned out to be a decree of the priests in honour of Ptolemy V, issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. The discovery of an alphabet was the first task. The demotic part of the inscription was first examined by de Sacy and Akerblad, and the significance of a number of the symbols ascertained. The hieroglyphic part was next carefully examined and compared with the demotic and Greek. At last, after much study, Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing. Hieroglyphic characters are either *ideographic*, i.e. using well-known objects as symbols of conceptions, or *phonetic*, i.e. representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough; thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water; milk by a milk-jar; oil by an oil-jar; fishing by a pelican seizing a fish; seeing and sight by an eye; and so on.—Cf. Sir E. A. Wallis Budge, *The Literature of the Ancient Egyptians*.

**Highgate**, a suburb of North London, 5½ miles from St. Paul's.

**High German**, originally the Teutonic dialect spoken in the southern and elevated parts of Germany, as distinguished from Platt Deutsch or Low German, spoken in the northern and more lowland portions of Germany. See *Germany*.

**Highland Park**, a city of Michigan, U.S.A. Pop. 46,499.

**Highland Regiments** are regiments originally raised and recruited in the



Highlands of Scotland, and wearing the tartan either in the shape of kilts or trews. These regiments are, in order of seniority, the Black Watch (42nd and 73rd), the Highland Light Infantry (71st and 74th), the Seaforth Highlanders (Ross-shire Buffs, the Duke of Albany's, 72nd and 78th), the Gordon Highlanders (75th and 92nd), the Queen's Own Cameron Highlanders (70th), Princess Louise's (Argyll and Sutherland Highlanders, 91st and 93rd). The majority of these regiments were first raised in the latter part of the eighteenth century in order to deal with the situation arising out of the French Revolution, but the 42nd dates from the earlier part, and was originally raised in 1730 as independent companies of a sort of *gendarmerie* whose duty it was to keep a semblance of order in their respective districts.

Highlands of Scotland, a somewhat indefinite geographical division of Scotland, north and west of a line running north-east from Dumbarton on the Clyde through the counties of Dumbarton, Stirling, Perth, Forfar, Kincardine; then north-west through Aberdeen, Banff, Moray, and Nairn to the shores of the Moray Firth. The Highlands are generally subdivided into two parts, the West Highlands and the North Highlands, the former of which contain the shires of Argyll and Bute, the Southern Hebrides, and part of Perth and Dumbarton; and the latter comprehend the counties of Inverness, Ross, Sutherland, the districts of Athol, Rannoch, and the Isles of Skye, Lewis, and others belonging to Inverness and Ross. The mountainous parts of Banff, Moray, Aberdeen, and Kincardine are also recognized as forming part of the Highlands; while Caithness (partly) and the Orkney and Shetland Isles are excluded, because their inhabitants are of Scandinavian origin. The whole of the district, which embraces the Celtic-speaking part of Scotland, is wild, rugged, and mountainous, with much grand and picturesque scenery. Forming, by their natural characteristics, a region distinct from the Lowlands of Scotland, the Highlands were long in a state of political semi-independence, and socially and otherwise—and particularly in retaining the use of the Gaelic tongue—the people have still certain characteristics peculiar to themselves. For history see *Scotland*.

High River, a town of Alberta, Canada,

40 miles south of Calgary, on the C.P.R. It is in a mixed farming area, and coal and oil are found in the vicinity. High River is a forest patrol centre and a Dominion air station. Pop. 1198.

High-seas, the open sea or ocean. 'High-seas' includes the whole of the sea below low-water mark and outside the body of a country. The jurisdiction of maritime states extends only for 3 miles. Inland seas and estuaries, of course, are excepted.

Hilary, or Hilarius, St. (c. 300–367), one of the early Fathers of the Church. His contests with the Arians caused his banishment to Phrygia. He wrote *De Trinitate, libri vii*.

Hilda, Saint (614–680), grand-niece of Edwin, King of Northumbria. She was successively head of the abbey of Hartlepool and of the famous monastery at Whitby. Cædmon, the Old English poet, was attached to the monastery during her rule.

Hildburghausen, a town of Germany, in Thuringia, with manufactures of toys and textiles. Pop. 7500.

Hildebrand. See *Gregory VII*.

Hilden, a town of Prussia, Rheinland, 9 miles E.S.E. of Düsseldorf, with thriving woollen and linen manufactures. Pop. 16,900.

Hildesheim, a city of Prussia, province of Hanover. It possesses a considerable trade, and the main industries are iron-founding and sugar-refining. Pop. 53,499.

Hill, Sir Rowland (1795–1879), English postal reformer. In 1837 he published a pamphlet recommending the adoption of a low and uniform rate of postage throughout the United Kingdom. The scheme was approved by a committee of the House of Commons, which examined it in detail in 1838, and in Jan., 1840, the penny postage system was carried into effect with the assistance of Hill, who, for this purpose, received an appointment in the Treasury. In 1846 he was made Secretary to the Postmaster-General, and in 1854 Chief Secretary to the Post Office. He also invented a rotary press for printing newspapers, and the adhesive stamp.

Hill, Rowland (1744–1833), English preacher. He published sermons and other theological works, of which the best known are his *Village Dialogues*.

Hill, Rowland Hill, first Viscount (1772–1842), British soldier. He entered the

army in his sixteenth year, was promoted captain in 1793, and became colonel of the 90th Regiment in 1800. He served with great distinction during the campaigns of Moore and Wellington in the Peninsula. At Waterloo he commanded the right wing of the British. In 1828 he was appointed general commanding-in-chief, the British army, a post which he held till 1842.

**Hilla**, a town of Mesopotamia, 60 miles south by west of Baghdad, on the Euphrates, among the ruins of ancient Babylon. It has good bazaars, and manufactures of silk and leather. Pop. about 30,000.—The division of Hilla has a pop. of 173,000.

**Hill Tippera**, a native state, India, adjoining the British district of Tippera, Eastern Bengal. The state is hilly, with broad intervening valleys. The principal crop is rice, tea is grown, and there are great forested areas. The government is despotic, and a resident political agent protects British interests. Area, 4116 sq. miles. Pop. 304,437.

**Hilversum**, a town of the Netherlands, province of North Holland, 18 miles E.S.E. of Amsterdam. It is a summer resort, and manufactures blankets, carpets, and cotton goods. Pop. 41,842.

**Himalayas**, a chain of snowy mountains in Asia, the most elevated on the earth, which separates the Indian Peninsula from the plateau of Tibet, between the Indus on the west and the Brahmaputra on the east; length, about 1500 miles; average breadth, about 180 miles. The great plain of India, south of the Himalayas, has a general elevation of 1000 feet above the sea. The Ibi-Gamin Pass in Garhwal is 20,457 feet, the Mustagh 19,019 feet, the Parangla 18,500 feet, the Kronbrung 18,313 feet, and the Dura Ghat 17,750 feet high. The rivers of the Punjab ('Five Waters') spring from a portion of the great chain which may be considered a distinct group under the title of the North-Western Himalayas. Some of the peaks here rise to a height of 24,000 to 25,000 feet. In the Central or Middle Himalayas are the sources of the Ganges and Jumna. Farther eastward, in Nepal, is the highest part of the Himalayas. Dhawalagiri has an elevation of 26,826 feet, Mount Everest, the highest known mountain in the world, is 29,002 feet; the Yassa group rises to the height of 26,680 feet, the Ibibia group to 26,306 feet. Going farther east, in Sikkim, we find Kangchenjunga, the western

peak of which is 28,156 feet high, the eastern 27,815 feet, while the Kabru ridge rises to 24,015 feet. Here terminates the region of the Middle Himalayas, most of the streams from which unite in the Ganges. The Eastern Himalayas, which extend from Sikkim east to the Brahmaputra and complete the chain, send all their waters to the last-named river, and are all comprised in Bhutan. A little to the east of Sikkim, Chamalari attains the height of 23,944 feet. About 250 miles farther east a conspicuous group has been observed with two peaks, named the Gemini or Twins, 21,500 feet high. Thence towards the east the mountains sink rapidly, but the range may be traced beyond the right bank of the Brahmaputra. This stream, as well as the Indus, rises on the north side of the Himalayas. The limit of perpetual snow in the middle division is stated to be about 15,500 feet on the south side and 18,500 feet on the northern. In Sikkim the snow-line descends on the south side to 14,500 feet, while on the north it rises to a level of 19,600 feet. Immense glaciers exist at various parts. The vegetation of the Himalayas is very rich, there being forests of pine, spruce, silver-fir, and deodar cedar at suitable elevations, with rhododendrons in rich profusion. Among the more characteristic animals are the yak, musk-deer, and wild sheep. See *Everest*. — **BIBLIOGRAPHY:** F. B. Workman, *In the Ice-World of Himalaya*; C. G. Bruce, *Twenty Years in the Himalaya*.

**Himanthalia**, a genus of Brown Algae, family Fucaceae. *H. lorea*, the sea-thong, is plentiful on some parts of our coasts.

**Himyarites**, the Homerites of Ptolemy, a group of people in Arabia, regarded as descendants of Himyar, one of the mythical ancestors of the Arabs. The Mahrah tribes of Southern Arabia are the direct descendants of the ancient Himyarites. The Himyaritic language, though not now spoken, is frequently found in inscriptions.

**Hinchinbrook**, an island off the north-east coast of Queensland, Australia.

**Hinckley**, a town of England, in the county of Leicester. The staple trade is hosiery, but there are also large boot and shoe factories. Pop. (1931), 16,030.

**Hindenburg**, Paul von (1847– ), German soldier. He entered the Prussian army in 1865, and served both in

the Austro-Prussian and Franco-Prussian Wars. He became major-general in 1900, rose to the rank of general of infantry, and retired from the army in 1911. When the European War broke out, Hindenburg was appointed commander of the German forces in East Prussia. He defeated the Russians at the battle of Tannenberg. He was commander-in-chief of the Austro-German forces on the Eastern front in 1915 and 1916, and became Chief of the General Staff of the army in Aug., 1916, retaining this position until the Armistice. He was the idol of the German people, but Ludendorff was to all intents and purposes the German generalissimo. His work *Out of My Life* appeared in 1920. In April, 1925, he was elected President of the German Republic.

**Hindi**, one of the languages of India, being that form of Hindustani which employs the Devanagari or Sanskrit character. There are many varieties of it. Hindustani, the *lingua franca* of India, developed out of one of its dialects.

**Hindley**, a town of England, in Lancashire. Cotton is manufactured and coal is mined. Pop. (1931), 21,629.

**Hindø**, the largest of the Lofoden Islands, off the north-west coast of Norway. There are several good harbours, especially at Harstad and Lødingen. Fishing is the chief industry. The area is 863 sq. miles, and the pop. 10,000.

**Hinduism** is a general term covering a vast number of various and often very discrepant cults and socio-religious systems of Hindustan, which have in some cases developed out of the religion of the Aryan tribes who made their way into the north-west of India at least 1000 B.C. (perhaps considerably earlier), and in other cases represent the religious ideas of certain races settled before the Aryans in Hindustan—Dravidians, Kolarians, &c., who have in greater or lesser measure accepted certain fundamental ideas from the Aryans. The earliest document of the religion of the Aryans is the *Rig-veda*, a collection, in ten books, of 1017 hymns by various priestly poets. These hymns are mostly addressed to the chief gods of the Aryan pantheon, who are in some cases nature-powers with a thin veil of anthropomorphic personality, such as Dyaushpita the Sky-father, Prithivi the Earth-mother, Ushas the Dawn-goddess, Parjanya the god of the Rain-storm, Surya the Sun-god, Vayu the Wind-

god; in other cases they are essentially personal deities of uncertain origin, such as Indra, and Varuna, whose chief function is to guard the moral order of the world; others again, frankly physical in origin, have developed special features in religious practice, such as Agni the Fire-god, and Soma, the spirit of an unknown plant of which the fermented juice was drunk in various rites to inspire mystic ecstasy. Among other gods worshipped were Vishnu, a kindly deity of obscure origin, and Rudra (later more commonly styled Siva), a spirit inclined to malignity. The rites connected with these cults were in earlier times fairly simple, but gradually they became more and more elaborate. Vishnu developed early into a god of gracious and beautiful attributes. His chief consort is the goddess Sri or Lakshmi (Fortune), and he is generally regarded as representing the forces of order in the cosmos. Of his incarnations or *avatars* for the preservation and regeneration of the world the most important are those in which he appeared as Rama and Krishna. Originally the cults of Rama and Krishna were quite distinct from that of Vishnu. Rama is a local hero of Ayodhya. The cult of Krishna is composite. Possibly he was a real person, a prince of the Satvat clan, who, on account of his religious and moral teaching (or perhaps for other reasons) was worshipped after death, under the title of Bhagavan, 'The Lord'. With these gods is associated a vast mass of legend and ritual, most recorded in Puranas and other religious works. But they do not by any means exhaust the resources of Hinduism. It has a crowd of other deities, ranging from important personalities such as Brahman the Creator, Sarasvati the goddess of learning, Ganesa or Ganapati the remover of obstacles, and the war-god Skanda (Kumara or Karttikeya, the son of Siva), down to insignificant and nameless local godlings, each with rituals and legends of his own, but all more or less definitely recognizing and recognized by the laws of the Greater Gods' pantheon.—**BIBLIOGRAPHY:** M. Monier Williams, *Religious Thought and Life in India*; R. W. Frazer, *Indian Thought, Past and Present*; E. O. Martin, *The Gods of India*.

**Hindu Kush**, a mountain system of Central Asia. It is generally considered as a continuation of the Himalayas, which it adjoins at the Indus. It then stretches

west till it unites with the Ghur Mountains in North Afghanistan.

**Hindustani**, the *lingua franca* of India, one of the chief languages of the country. It is analytic in structure, and is divided into nearly sixty sub-dialects. Hindustani is the vernacular of about 100 million people. When written in the Persian character, and containing many Persian words and phrases, it is known as Urdu; another form of it is Hindi.

**Hinganghat**, a town of India, 50 miles south-west of Nagpur. It is an important cotton-growing centre. Pop. 12,500.

**Hipparchus** (died c. 126 B.C.), Greek mathematician and founder of scientific astronomy. *A Commentary on the Phenomena of Aratus* is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, and prepared a catalogue of the fixed stars.

**Hipparion**, a fossil genus of the horse family, of the Upper Miocene and Pliocene periods, between the size of an ass and that of a zebra.

**Hippo**, an ancient Numidian city, the ruins of which still exist a short distance south of Bona, in Algeria.

**Hippoboscidae**, or **Pupipara**, a family of dipterous insects, parasitic on birds and quadrupeds; also on bees. The horse forest-fly, the fowl-fly, the sheep tick, and the bee-louse belong to this family.

**Hippocampus**, a genus of small fishes about 9 inches long, closely allied to the pipe-fishes, of singular construction and peculiar habits. They bear some slight resemblance to a miniature horse, and swim in a vertical position.

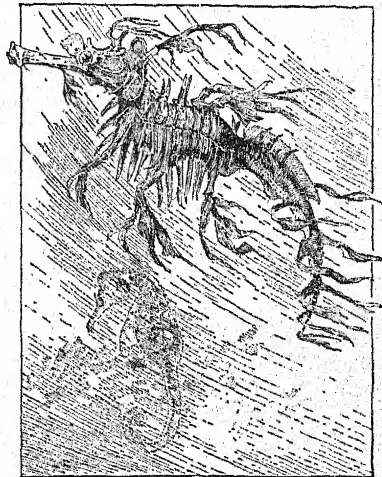
**Hippocrates** (460-357 B.C.), Greek physician. His writings, which were early celebrated, as they are quoted by Plato, became the nucleus of a collection of medical treatises by a number of authors of different places and periods, which were long attributed to him, and still bear his name. These works, seventy-two in number, include treatises by his sons Thessalus and Draco, by Polybus, and others. An edition, with translation, by W. H. S. Jones appeared in the Loeb Library in 1924.

**Hippocrene**, a spring on Mount Helicon, in Bœotia, consecrated to the Muses. It

is said to have risen from the ground when struck by the hoofs of Pegasus.

**Hippolytus**, in Greek mythology, son of Theseus and Antiope or Hippolyte, queen of the Amazons. His stepmother, Phædra, fell in love with him, and accused him to his father in order to revenge herself for his indifference. He was exiled and accidentally killed, but his innocence being afterwards established, Phædra destroyed herself.

**Hippolytus** (third century A.D.), a writer of the early Church. The most important of his writings is the *Philosophumena*, a refutation of heresies, discovered at Mount Athos in 1842.



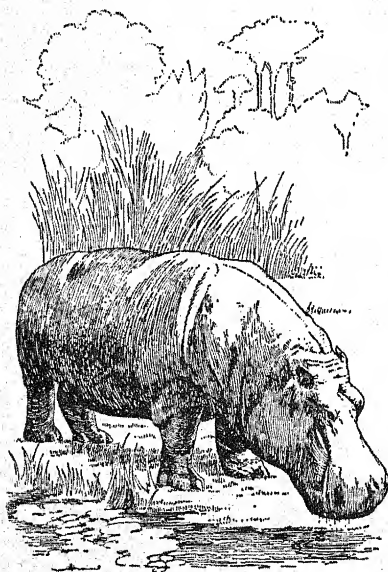
Hippocampus, or Sea-horse

**Hipponax** (sixth century B.C.), Greek satirist. He is supposed to have been undersized and ugly, and, like many men of small dimensions, endowed with a caustic wit. He is chiefly celebrated for introducing or inventing a new metre, which is known as the choliambic, scæzon, or limping iambic. This metre is extremely suitable for playful satire. The fragments of Hipponax which have been preserved amount in all to about a hundred lines.

**Hippopotamus**, the typical genus of a family of non-ruminating artiodactyle Ungulates, of which two living species are known. One species, *H. amphibius*, is of



large size, and is common throughout the greater part of Africa; the other, *H. liberiensis*, is not only smaller, but has other important differences, and is found only in the African west-coast rivers, and those flowing into Lake Chad. The former species has a thick and square head, a very large muzzle, skin about 2 inches



Hippopotamus (*Hippopotamus amphibius*)

thick on the back and sides, and without hair, except at the extremity of the tail. The incisors and canines or tusks of the lower jaw are of great strength and size. These tusks sometimes reach the length of 2 feet and more, and weigh upwards of 6 lb. The animal is killed partly on account of the tusks and teeth. The hippopotamus attains the length of 14 feet, or possibly more. It lives in water, feeds on water-plants, and is an excellent swimmer.

**Hippuris.** See *Mare's-tail*.

**Hippurites**, a genus of fossil bivalve molluscs, found in the Upper Cretaceous. They are allied to *Chama*, the gaping cockle.

**Hirado**, a Japanese island, lying about 55 miles N.N.W. of Nagasaki. It is 19 miles

long. It has always been celebrated for its porcelain. The seaport of Hirado is a large whaling-station. Pop. 35,000.

**Hirosaki**, a city of Japan, Island of Honshu, about 20 miles from Aomori, on the north coast. It is noted for its silk goods and lacquer ware. It is the centre of an apple-growing district. Pop. 35,000.

**Hiroshima**, a city of Japan, situated on a bay in the south of the Island of Honshu, 175 miles w.s.w. of Kobe. It has manufactures of and a good trade in lacquer, bronze, and porcelain goods. There is a fair coastal shipping trade. Pop. (1925), 195,731.

**Hirschberg**, a town of Germany, in Silesia, 26 miles south-west of Liegnitz, with manufactures of linen goods and machinery. Pop. (with suburbs), 20,560.

**Hissar**, a town of India, in the Punjab, administrative head-quarters of the district of the same name, on the Western Jumna Canal, 102 miles west of Delhi. Pop. 17,000. The district has an area of 5217 sq. miles. Pop. 805,000.—Hissar is also the name of a district and town in Turkistan, in East Bukhara (Uzbek Republic). Sword-blades and knives are made in the town, and grain, cotton, and rice are raised in the district. Pop. of town, 10,000.

**Histology**, in biology, the study of the cell aggregates or *tissues* composing the bodies of higher organisms, and specialized for diverse functions in accordance with the principle of division of physiological labour. The lowest plants and animals consist of single cells, which are sometimes complex, while in multicellular organisms there is gradual differentiation of cell-groups, which reaches its climax in seed-plants and vertebrate animals.

**Plant Histology.**—Typical plant cells are invested by firm membranes or *cell-walls*, which vary in thickness and chemical composition in the different tissues. In some cases the protoplasmic contents entirely disappear, being used up in formation of the thickened cell-walls, which play a passive part in the economy. The following tissues are those of most importance. (1) *Meristem*, actively dividing tissue composed of small cells with thin cellulose walls and abundant protoplasm. Two kinds are distinguished, primary and secondary. Cambium and phellogen are both secondary meristem. For details see *Meristem*. (2) *Per-*

*manent tissues*, which are divided into several groups (see *Tissues*).

*Animal Histology*.—The vast majority of animal cells are devoid of definite external walls, and when these do occur, they are not composed of cellulose. The *intercellular substance* present between the component cells of a tissue is called *matrix*. In some tissues, cells are associated with fibres and other cell products. The tissues are divided into *embryonic tissue* and *permanent tissue*. A. *Embryonic tissue*. The embryo of a vertebrate animal is made up of three actively dividing *germinal layers*, the *epiblast* (ectoderm) or external, the *hypoblast* (endoderm) or innermost, and the *mesoblast* (mesoderm) or middle. From these all the various parts of the body arise. The layers are broadly comparable to the primary meristem of a higher plant. B. *Permanent tissues*. (1) *Blood and lymph*; for the details of these see the articles *Blood*; *Lymph*. (2) *Epithelium*, layers of cells covering the exterior of the body and lining the internal cavities. In the case of certain internal tubes, the epithelial lining is *ciliated*. (3) *Supporting tissues*. (a) *Connective tissue* is made up of branching cells and delicate fibres, white in tendons, yellow where the fibres are larger and where elasticity is necessary, and both white and yellow (areolar) below the skin. (b) *Cartilage or gristle* consists of cells embedded in a tough translucent matrix, which may be traversed by fibres (fibro-cartilage). (c) *Bone* contains branching cells embedded in an organic matrix which is strengthened by the deposit of salts of lime (carbonate and phosphate). It may be spongy or compact, as in the ends and shaft, respectively, of a long bone. (d) *Dentine and enamel* are hard substances making up the greater part of teeth. The former is also known as *ivory*. (4) *Muscle* is of three kinds—*unstriated*, *cardiac*, and *striated* (see *Muscle and Muscular Motion*). (5) *Nerve*; the details of this are given under *Nervous System*. BIBLIOGRAPHY: Sir E. A. Sharpey-Schafer, *Essentials of Histology*; E. B. Wilson, *The Cell in Development and Inheritance*; W. E. Agar, *Cytology*.

**History** is usually divided into three compartments, ancient, mediæval, and modern. Ancient history covers the history of the world up to the fall of the Roman Empire. It includes the records of the Hebrew, Arabian, Phœnician, Egyptian,

and other races, as well as the history of Greece and Rome. The two earliest centres of recorded human civilization were Babylon and Egypt, and for the long period of over 2000 years (c. 5000–2500 B.C.) ancient history is the story of the independent development of these two countries, each of which produced a remarkable civilization. The next stage is the expansion of Babylon, which, under the rule of Hammurabi (c. 2250 B.C.), founded an Empire that lasted until about 1600 B.C., when it fell, largely owing to the growth of the new Assyrian power in the North. For about 500 years after that date, the Egyptian Empire was the great World Power, and it exercised dominion over Syria. From about 1100 to 900 B.C., when the power of Egypt had declined, we have the rise of independent kingdoms in Syria—Tyre in the north, the Philistines in the south, and the Israelites in the south-east. The Kingdom of Israel reached the height of its greatness in the reign of Solomon (c. 1015–977 B.C.). Then for nearly three hundred years (c. 900–600 B.C.) the Assyrian Empire was the ruler of the world, its greatest period being the reign of Sennacherib (705–681 B.C.). It collapsed from internal weakness and from the attack of the Medes, and the very site of its great capital, Nineveh, was long unknown. Its place was taken by two powers, the Chaldeans or Babylonians under Nebuchadnezzar, and the Medes, who, about 550 B.C., were conquered by the Persians under Cyrus. He subsequently reduced the Babylonians to subjection and formed the Persian World-Empire, which lasted for half a century, under Cyrus, Cambyses, and Darius. The Persian Empire came into conflict with the Greeks, and the victory of the Greeks shifted the centre of civilization from the East into Europe. Greek history begins not later than 1000 B.C.; but it is not until about 700 B.C. that much is known about it, and its greatness followed the Persian Wars and the battles of Marathon and Salamis (490 and 480 B.C.). The result was the development of a series of Greek Empires—Athenian, Spartan, Theban, and Macedonian, which occupy the historical stage until the death of Alexander the Great in 323 B.C. The division of his Empire after his death prepared the way for the emergence of the Roman power. The early centuries of Roman history are

occupied with the rise of the city and the extension of its authority over the Italian Peninsula. When this task was accomplished, in the end of the third century B.C., Rome became involved in a struggle with the African power which had arisen at Carthage, and its victory was followed by the establishment of a Roman Empire in the East (200 B.C.-44 B.C.), and by the creation of a World-Empire, which coincides with the end of the Roman Republic and the institution of the Principate or Empire under Augustus and his successors.

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**Hoboken**, a city, New Jersey, U.S.A., on the Hudson River, and close to Jersey City. It lies opposite New York, with which it is connected by tunnels and ferries. It is a busy port, and has manufactures of machinery, chemicals, pencils, &c. Pop. 68,166.

**Hoche**, Lazare (1768-1797), French general. He greatly distinguished himself at the siege of Thionville and the defence of Dunkirk, and shortly afterwards, when scarcely twenty-five years of age, received the command of the Army of the Moselle. In 1796 he conceived the plan of attacking Britain, by making a descent on Ireland. He accordingly set sail in December from Brest, but the expedition failed utterly. After his return he received the command of the Army of the Sambre and Meuse.

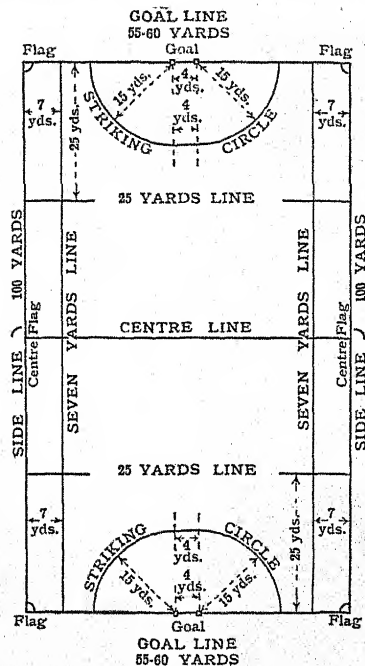
**Hochheim**, a town of Prussia, in the province of Hesse-Nassau, 4 miles E.N.E. of Mayence. It is famous for its wine, called in Germany *Hochheimer*, English *Hock*. Pop. 3480.

**Höchst**, a town of Prussia, Germany, on the Main, 6 miles from Frankfurt. There are large dyeworks, and manufactures of machinery, tobacco, and beer. Pop. 17,200.

**Hock**. See *Wines and Spirits*; *Hochheim*.

**Hockey**, a ball game, the name of which is probably derived from the hooked stick employed. Except for girls, hockey is not popular with the authorities of public schools, nor have the Continental nations taken to it with enthusiasm. In its rules and in the constitution of teams hockey bears a very close resemblance to Association football. The side of eleven players comprises a goalkeeper, two backs, three half-backs, and five forwards. The ball employed is of leather, white or painted white; usually a painted cricket-ball is used. The sticks must not exceed 28 oz. in weight, and must be of such size as to pass through a 2-inch ring. They are slightly curved at one extremity, and flattened on the left-hand surface. The ground for play is rectangular, 100 yards long and 60 yards in width, with boundaries marked by chalk-lines, and flags at the corners. The boundaries are known as goal-lines and side-lines. The goals (in the centre of each goal-line) are two posts 4 yards apart joined by a crossbar 7 feet from the ground. In front of the goal is drawn 'the striking circle'—a semicircle, having the goal-line as a diameter and

with a radius of 15 yards. The game is started by the 'bully off', as it is called. The centre-forwards of the respective teams face each other with the ball between them, and each strikes the ground with his stick on his own side of the ball and his opponent's stick three times alternately, after which the ball itself may be struck.



The flag-posts at each end of the centre-line must be 1 yard outside the touch-line.

The 25-yards line must not be fully drawn, but only its extremities (7 yards only to be marked at each end).

A goal is scored by the ball being hit through the goal by a player whilst within the striking circle. The off-side rule applies exactly as in Association football. The ball may be caught by the hand, but must be immediately dropped, and it may be stopped by the foot but not kicked. Only the flat side of the stick may be used for striking the ball; using the other side constitutes a foul with a penalty attaching thereto. An opponent's progress may be

stayed by hooking his stick, but only if the stick is within striking distance of the ball. Further, if a player strikes at the ball, no part of the stick must rise above his shoulders throughout the stroke. Disregard of this rule is penalized (as in the case of other fouls) by the award of a free hit to the other side. As has been stated, the general principles of the game are exactly those of Association football, with a roll in from touch whenever the ball crosses the side-lines, and a corner hit allowed to a side if an opposing player hits the ball behind his own goal-line. Play is usually for two periods of thirty-five minutes, with a short interval during which ends are changed. Most universities have a hockey team, and there are numerous other clubs throughout the country. The Cambridge players in the inter-university contests are awarded full blues, but the members of the Oxford team only get half-blues. County matches lead by gradual selection to the international matches, the first of which was played in 1895 (Oxford had competed with Cambridge first in 1890). Ladies' inter-county and international contests also take place. The Hockey Association, which is responsible for the rules and organization of the game, was founded in 1875.

*Ice-hockey* requires exceptional experience of skating, and when teams representing Oxford and Cambridge meet at Mürren in December, the majority of the players are Canadians who have had many years experience before coming to study in this country, with a minority of English players who have had exceptional opportunities. It is probably the fastest and in some respects the most skilful of all games.—Cf. A. Farrel, *How to Play Hockey* (Spalding's Athletic Library).

**Hocking**, Silas Kitto (1850– ), British novelist. His works include: *Real Grit* (1887), *God's Outcast* (1898), *Who Shall Judge?* (1910), *His Own Accuser* (1917), *Nancy* (1919), *Watchers in the Dawn* (1920), and *The Man who was Sure* (1930).

**Hodeida**, a seaport of Yemen, Arabia, on the Red Sea, with an extensive trade in coffee. It also exports cotton and millet. Pop. 40,000.

**Hodmezövasarhely**, a town of Hungary, on Lake Hodos. It is in a fertile district, and the township owns 300 sq. miles of territory. Cattle are extensively reared, there are large vineyards, and

wheat, barley, oats, and maize are grown. Oil-refining and brewing are also important. Pop. 60,922.

**Hof**, a town in Bavaria, Upper Franconia, on the left bank of the Saale. It has woollen, linen, cotton, leather, and paper manufactures. Marble and ironstone are worked in the vicinity. Pop. (1925), 41,377.—There is also a town called Hof in Norway, north of Oslo.

**Hofer**, Andreas (1767–1810), Tirolese patriot. In 1809 he took the lead in an insurrection of the Tirolese for shaking off the yoke of Bavaria, to which their country had been transferred by the Treaty of Pressburg. In a short time, with intermittent assistance from the Austrians, he defeated the French and Bavarian troops, and nearly the whole country was liberated. Hofer then carried on the military and civil administration till the Peace of Vienna was proclaimed. Misled by false reports, he commenced hostilities anew, but was at last betrayed to the French, and tried by a court-martial and shot.

**Hoffmann**, August Heinrich, called also *Hoffmann von Fallersleben* (1798–1874), German lyric poet and philologist. He wrote *Horæ Belgicæ*, but is best known by his songs, especially *Deutschland, Deutschland über Alles*.

**Hoffmann**, Ernst Theodor Amadeus, or, properly, Ernst Theodor Wilhelm (1776–1822), German novelist. Among his works of fiction are the *Phantasiestücke in Callots Manier* (1814), the *Elxiere des Teufels* (1816), the *Nachstücke* (1817), the *Serapionsbrüder* (twenty-three tales, 1819 et seq.), *Lebensansichten des Katers Murr* (1820–1822), and many others.

**Hofuf**, a town of El Hasa, Arabia, lying about 100 miles south of El Katif. It is on the Pilgrim Road to Mecca. Pop. about 20,000.

**Hogarth**, William (1697–1764), English painter and satirical artist. His celebrated series of pictures called *The Harlot's Progress* brought his great powers fairly before the public. The engravings of these, which became exceedingly popular, were published in 1734. This was followed by *The Rake's Progress* and *Marriage à la Mode*, two similar series of paintings and engravings; *Industry and Idleness*, *Beer Street and Gin Lane*, *The Election*, *The Enraged Musician*, *The Country-Inn Yard*, *The March to Finchley*, *Strolling Actresses Dressing in a Barn*, *Four Stages of Cruelty*,



and many other engravings which all evinced his extraordinary powers of satire, wit, and imagination. He also painted a number of masterly and strongly characterized portraits, notably those of himself, Garriek, Lovat, and Wilkes. In 1753 his work on the *Analysis of Beauty* appeared. Hogarth is the first and among the greatest of a distinctively English school of painting, marked by literary tendencies, realism, and feeling for colour.—Cf. Austin Dobson, *Hogarth*.

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Hog Island, an island in the Delaware River, U.S.A., off Philadelphia. It is 946 acres in extent, and was mostly marsh till in 1917 it became a great and important shipbuilding centre.

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Hohenlohe-Schillingsfürst, Chlodwig Karl Victor (1819–1901), Prince of Hohen-

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Hohenstein, a town of Germany, in Saxony, 10 miles west of Chemnitz, with textile factories. Pop. 13,397.

Hohenzollern, a small territory of Germany, Prussia. It consists of a long, narrow, irregular strip of country, entirely surrounded by Württemberg and Baden. Area, 441 sq. miles. Pop. (1925), 71,840.

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**Holborn**, a borough of London. Pop. (1931), 38,816.

**Holcus**, a genus of grasses (nat. ord. Gramineæ), extremely common in some pastures, but not popular with cattle. Only two species are British, the woolly soft grass or Yorkshire fog (*H. lanatus*) and creeping-rooted soft grass (*H. mollis*).

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**Holinshed**, Raphael (died c. 1580), English chronicler. He is only known by his *Chronicles of Englande, Scotlande, and Irelande* (1577), from which Shakespeare drew material for *Macbeth*, *King Lear*, and *Cymbeline*, and for most of his historical plays.—Cf. W. G. Boswell Stone, *Shakespeare's Holinshed*.

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**Holland, Kingdom of**. See *Netherlands*.

**Holland, North, and Holland, South**, two provinces of the Netherlands. The greater part of the former consists of a peninsula, bounded by the North Sea on the west and the Zuider Zee on the east. Area, 1066 sq. miles. It lies very low, and is generally fertile. It is intersected by the Great North Holland Canal. The chief towns are Amsterdam, Alkmaar, Haarlem, Helder, and Zaandam. Pop. 1,336,294.—*South Holland*, the most populous province of the Netherlands, is bounded on the north by North Holland, on the west by the North Sea. The southern part of the province is broken up into several islands. Area, 1131 sq. miles. Like North Holland, it is a flat and depressed tract. The chief river is the Rhine, with its numerous branches. The soil is fertile and well cultivated. The principal towns are Delft, Dort, Gorkum, Gouda, Leyden, Rotterdam, Scheidam, and The Hague. Pop. 1,678,670.

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and etchings from the works of Titian and Van Dyck.

**Holloway**, Thomas (1800-1883), English patent-medicine proprietor and philanthropist. He founded a sanatorium or asylum for the insane, and hospitals for incurables and convalescents, at Egham, Surrey, 1873; and also at the same place the Royal Holloway College (opened 1886), for women-students.

**Holly** (*Ilex*), a genus of plants of the order Aquifoliaceæ, embracing a number of evergreen trees or shrubs. The common holly (*I. aquifolium*) is common in Britain and the continent of Europe. It is a handsome, conical evergreen tree, growing to the height of 20 or 30 feet. Its leaves are dark-green, shining, and leathery, abundantly armed with prickles on the lower branches, but free from them on the upper, or on very old trees. The flowers are white, appearing in May; the fruit is red, ripening in September, and remaining on the tree all the winter. The wood is hard and white, and is used for knife handles and for turnery work. The American holly (*Ilex opaca*) sometimes attains the height of 80 feet, with a trunk 4 feet in diameter. The *I. glabra* is another species of holly, inhabiting the coast regions of the United States. The *Yerba maté* or Paraguay tea-plant is a species of holly (*I. Paraguayensis*).

**Hollyhock**, a biennial plant (*Althæa rosea*), nat. ord. Malvaceæ. It is a native of China, and is a frequent ornament of gardens. There are many varieties. It reaches a height of 8 feet or more.

**Holme Cultram**, a village of Cumberland, England, 5 miles north-west of Wigton. Farming implements are made. Pop. (1931), 4735.

**Holmes**, Oliver Wendell (1809-1894), American essayist, poet, and physician. In 1847 he was appointed to the chair of anatomy at Harvard, a position which he filled till 1882. His chief works, besides several volumes of poems, and treatises on medicine, are: *The Autocrat of the Breakfast Table*, *The Professor at the Breakfast Table*, and *The Poet at the Breakfast Table*; *Elsie Venner*, *The Guardian Angel*, *A Morbid Antipathy*, and *Emerson* (in American Men of Letters Series). A visit to Europe in 1886 produced a charming record, *Our Hundred Days in Europe*.— Cf. J. T. Morse, *Life and Letters of Holmes*.

**Holmfirth**, a town of Yorkshire, Eng-

land, in the West Riding. It manufactures woollens. Pop. (1931), 10,407.

**Holm-oak** (*Quercus Ilex*), a shrub-like tree, native of the Mediterranean countries, with holly-like leaves. In Britain it forms an ornamental evergreen bush of from 20 to 30 feet high.

**Holothuria**, the type of a class of Echinoderms, the Holothurioidea or sea-cucumbers. See *Trepang*.

**Holy Grass** (*Hierochloë*), an odoriferous genus of grasses belonging to the Phalaridæ, and consisting of several species spread over the cold parts of both hemispheres. The *H. borealis*, or northern holy-grass, is found in Scotland.

**Holyhead**, a seaport of North Wales, in the county of Anglesey, situated on Holy or Holyhead Island. It has a good harbour of refuge for vessels of any size, and is a terminus of the passenger traffic to Dublin. Pop. (1931), 10,707.

**Holy Island**, or **Holyhead Island**, an island of North Wales, county Anglesey, separated from the mainland by the Menai Straits, which are crossed by a causeway. The island is 7 miles long by 5 miles broad.

**Holy Island**, or **Lindisfarne**, an island (length,  $2\frac{1}{2}$  miles) off the north-east coast of England, 11 miles south-east of Berwick. It is  $1\frac{1}{2}$  miles from the mainland, with which it is connected by a narrow neck of sand, traversable at low water. The village of Lindisfarne on the south-west is much resorted to by summer visitors, but the great object of interest is the extensive ruined abbey of Lindisfarne, founded in A.D. 635 by Oswald, King of Northumbria, destroyed by the Danes, and restored by the Normans in 1082. The castle, on a rock 90 feet high, also dates from an early period. Pop. 586.

**Holyoke**, a city of Massachusetts, U.S.A. It is a prosperous manufacturing place, a dam across the river supplying it with extensive water power. It has manufactures of paper, cotton, wool, and wire; and machine works. Pop. 60,203.

**Holy Roman Empire**, a title which the German Empire received in 962 when Otho I was crowned at Rome by Pope John XII. It came to an end when Francis II became hereditary Emperor of Austria in 1804. See *Austria-Hungary; Germany*.

**Holyroodhouse**, Palace and Abbey of, in Edinburgh, at the east end of

the old town. The abbey church, founded in 1128 by David I, is now mostly in ruin. The palace was erected in successive parts from 1501 to 1679, and contains the rooms associated with the events in the reign of Mary Queen of Scots, such as the murder of Rizzio, and a gallery 150 feet long, in which are portraits of all the Scottish kings, most of them imaginary.

**Holy Spirit, or Holy Ghost**, the third person of the Trinity. The doctrine of the Nicene and Athanasian creeds is that the Holy Spirit proceeded from the Father and the Son, and is co-eternal and equal with both. This doctrine is adopted by Roman Catholics, Lutherans, and Calvinists alike. The Eastern Church, however, following the Council of Alexandria held in 362, asserts that the Holy Spirit proceeds from the Father alone.

**Holy Water**, in the Greek and Roman Catholic Church, salted water which has been consecrated by prayers, exorcism, and other ceremonies, to sprinkle the faithful and things used for the Church. It is placed at the door of churches, so that worshippers may sprinkle themselves with it as they enter.

**Holywell**, a market town in Flintshire, North Wales, on the estuary of the Dec, 17 miles south-west of Liverpool. Near the town are coal- and lead-mines, and quarries. Pop. (1931), 3423.

**Holzminden**, a town of Germany, in the Prussian province of Hanover. It has manufactures of iron, glass, chemicals, and machinery. Pop. 10,000.

**Homage**, in feudal law, a formal acknowledgment made by a feudal tenant to and in presence of his lord on receiving the investiture of a fief or coming to it by succession, that he was his vassal.

**Homburg vor der Höhe**, a town of Prussia, province of Hesse-Nassau, 9 miles N.N.W. of Frankfurt. It is much frequented on account of its mineral springs and bathing establishment. Pop. 14,344.

**Home, Henry**. See *Kames, Lord*.

**Home, John** (1722-1808), Scottish dramatic poet. He studied for the church, and was appointed to the parish of Athelstaneford. His tragedy of *Douglas* was performed at Edinburgh in 1756, and at Covent Garden (with Peg Woffington in the cast) in 1757, and attained a wonderful popularity. He thought it wise to resign his charge and retire to England. His other plays, *The Siege of Aquileia*,

*The Fatal Discovery*, *Alonzò*, and *Alfred*, are absolutely forgotten.

**Home Office**, The, dates from 1782, when it was formed from the 'Southern' Secretaryship of State. At the present time the Secretary of State for the Home Department is charged with the maintenance of order and the repression of crime in England and Wales. In his hands lie the supervision and control of English and Welsh prisons and convict establishments; he is also responsible for the administration of the Factory Acts, the Coal and Metalliferous Mines Acts, Poor Law Acts, &c. Further, this minister, always a member of the Cabinet, is the proper channel for addresses to the Crown and the replies to such. Finally, it is on the 'advice' of the Home Secretary that the Crown exercises, or declines to exercise, its prerogative of remitting the death sentence.

**Homer** ('*Ὅμηρος*'), the name attached as that of their (traditionally blind) author to the two great Greek epics, the *Iliad* and the *Odyssey*, and also to certain minor poems, the *Homeric Hymns*, a collection of poems addressed to various divinities, the *Margites* (The Madman), which, from the fragments which remain, appears to have been a mock-heroic epic; another mock-heroic epic the *Batrachomyomachia* (The Battle of the Frogs and the Mice), and a collection of epics dealing with the Trojan War and known as the *Cyclic Poems*, of which only small fragments remain. These minor poems are of comparatively small account; their connexion in authorship with the *Iliad* and *Odyssey* is, to say the least of it, very doubtful; and it is the two great epics which are here mainly to be considered.

The *Iliad* deals with an episode of the Trojan War, the wronging of Achilles, the greatest of the Greek warriors, by Agamemnon, the supreme leader of the host, in the matter of the captive maiden Briseis, the wrath which Achilles thereupon conceives, and the consequences and final appeasement of his wrath. The Greeks suffer disaster through his withdrawing himself from the fight; Patroclus, his bosom friend, is slain by the Trojan champion, Hector, son of Priam, the king; he is roused to slay Hector in revenge, and the poem ends with the ransoming of Hector's body by his father. The *Odyssey* tells of the wanderings and adventures

of Odysseus (Ulysses) in the course of his return to Ithaca after the capture of Troy, and of what had meanwhile gone forward in his house, where Penelope, his wife, was besieged by suitors; and finally relates how Odysseus and his son Telemachus, whom he had left an infant when he set out for Troy, encountered and slew the suitors, and how husband and wife were reunited.

Herodotus, the historian, who flourished about 440 B.C., speaks of Homer as having lived about 400 years before himself; and for long a personal Homer, the author of all the poems above mentioned, appears to have been taken for granted. About the third or second century B.C. a school of Homeric critics, among whom the most eminent was Aristarchus, existed at Alexandria; and the result of their criticism was that the authorship of Homer was confined to the *Iliad* and the *Odyssey*, the other poems being regarded as not genuine. Among these critics, however, some appear to have gone a step further. A sect known as the Chorizontes ('Separators') held that the *Iliad* alone was to be assigned to Homer, and that the *Odyssey* was the work of another author. Their views produced little or no effect.

There the ancient scrutiny of Homeric authorship may be said to have stopped; and it was not till what may almost be called our own time that the matter was reopened. Robert Wood in his *Essay on the Original Genius of Homer*, published in 1769, appears to have been the first fully to realize the importance of the question whether the art of writing was practised at a date to which the composition of the epics could be assigned. He answered this question in the negative; and this answer was the keystone of the theories of Friedrich August Wolf, who in his *Prolegomena ad Homerum*, published in 1795, maintained that poems forming the basis of the epics were put together from older pieces of various authorship by a poet of commanding genius whom he often calls 'Homer'; that, writing being unknown, or at any rate not yet employed for literary purposes at the time of the putting together of the poems, the poems were for long transmitted by memory and oral recitation; that in the course of transmission alterations and additions, deliberate or accidental, were made; that the poems were not written down till

about 550 B.C., and after being written down suffered still further changes deliberately made by 'revisers' or critics until they attained their present state; and that the artistic unity seen in the epics as we possess them is due not so much to 'Homer' as to later artificial treatment. In asserting that the epics were not written down before 550 B.C., Wolf chiefly relied on a doubtful and vague tradition to the effect that a definite text was first settled from scattered materials and committed to writing at Athens in the time of the tyrant Pisistratus (died 527 B.C.) K. K. F. W. Lachmann (1793-1851) tended to minimize the influence of 'Homer'. He split up the *Iliad* into no fewer than eighteen separate and originally independent 'lays' by various hands strung together by the primitive poet. George Grote (1794-1871) conceived the *Iliad* as having been originally a comparatively short poem, an *Achilleid*, dealing solely with the wrath of Achilles, and as having been expanded to its present dimensions by a later poet whom he regarded as the true Homer. Other scholars, such as W. Christ, W. D. Geddes, and Dr. Walter Leaf, have each in his own way continued the analysis of the *Iliad* on the general lines of Lachmann; but other scholars, such as the late Andrew Lang, have strenuously maintained that the epics were composed substantially in their present form by a single poet, though they, of course, admit that minor changes in the text must have taken place in the course of the long transmission. It will be noticed that the scholars who question the unity of authorship have devoted their chief attention to the *Iliad*, which from the nature of its plan is of comparatively loose structure. Attempts have been made to split up the *Odyssey* also; but these cannot be said to have been successful. The plot of the *Odyssey* is, in fact, of the most ingenious and closely-knit construction; and while it is, of course, possible to attribute different parts of the poem to different hands, just as we might deal with a modern novel in which plot and subplot are interwoven, it is on the face of it far more probable that the cunningly-contrived structure is the work of one brain.

Such, in brief, was the state of the Homeric question up to the time of the discoveries made in Crete from 1900 onwards by Sir Arthur Evans and his



followers. These discoveries have completely changed our conceptions of the early history of the Ægean area. Formerly the men of the age to which the epics were assigned were regarded as more or less rude, as standing at the beginnings of civilization. We now know that they looked back over a space of civilization at any rate as great as the space which lies between us and them. In Wolf's theory the fundamental proposition was his denial that the literary use of writing could be assumed for any age to which the epics could be assigned. We now know that the art of writing was practised long before any date which can possibly be fixed for them; and it may confidently be assumed that if at the place and date of their composition the art of writing was felt, as it certainly would be, to be useful for literary purposes, it would be practised. There seems, therefore, to be no serious objection to our supposing, in one of the cities of Asia Minor (say Smyrna), somewhere about 800 or 700 B.C., the existence of a great poet named Homer writing his epics in a period of poetical activity in the midst of fellow-poets whose works are partially represented by the *Cyclic Poems*. So far as extant remains show, the poets of the age would seem to have taken their themes from stories about or connected with the Trojan War (which may be regarded as actually historical); but, of course, many poems on other themes may have perished. It is perhaps not entirely fanciful to picture a period of epic activity at Smyrna not unlike the period of dramatic activity in Elizabethan London. At any rate, opinion seems now to be moving in the direction of a personal Homer composing and writing down his epics substantially in the form in which we have them, though the text must from obvious causes have suffered a certain measure of corruption, and must have been added to or mutilated here and there by editors or copyists. But not a few still maintain the older views.

The best modern text of the *Iliad* and *Odyssey* is that published at Oxford by the Clarendon Press in its series of classical texts. The best English prose translations are the translation of the *Iliad* by Lang, Leaf, and Myers, and that of the *Odyssey* by Butcher and Lang. Translations in verse are numerous. That of both epics

by Pope, though it is not at all like Homer, has at any rate the merit of being readable, a characteristic shared by few or none of the others. Jebb's *Homer: an Introduction to the Iliad and the Odyssey* should be referred to.

**Home Rule.** See *Ireland*.

**Homestead**, a city of Pennsylvania, U.S.A., 7 miles south-east of Pittsburg. It has one of the largest steel-plants in America. Pop. 21,000.

**Homicide**, the killing of one man or human being by another. In law, homicide is of three kinds—*justifiable*, *excusable*, and *felonious*; *justifiable*, when it proceeds from unavoidable necessity, as where the proper officer inflicts capital punishment, where a person is killed to prevent him committing a forcible and felonious crime, where an officer of justice kills an offender who assaults or resists him and who cannot otherwise be captured, or where persons are killed in the dispersion of rebellious or riotous assemblies; *excusable*, when it happens from misadventure, as where a man in doing a lawful act by accident and without negligence kills another, or in self-defence, as where a man kills another in defence of the life of himself; his wife, children, parent, servants, &c., *felonious*, when it proceeds from malice, or is done in the prosecution of some unlawful act, or in a sudden passion, or without justification or excuse. Felonious homicide comprehends murder and manslaughter. In Scots law manslaughter gets the name of *culpable homicide*. See *Manslaughter*; *Murder*.

**Homœopathy**, a system of therapeutics built upon the law that likes are cured by likes, discovered by Hahnemann, and elaborated in his various works. The law of similars in practice demands no experimentation on the sick, but detailed and careful provings of drugs on the healthy. A drug given to persons in health consistently produces a sickness peculiar to itself. The totality of the symptoms produced gives the complete drug-disease picture, and the similarity between the drug picture and the symptoms of the sick individual determines its applicability as the curative remedy. The closer the similarity between the drug and disease pictures, the greater the sensitiveness of the patient's reaction to the remedy. It is the reaction of the drug that is desired, and, consequently, the minuter the dose which will



produce the desired effect without first aggravating the trouble, the speedier the cure. Hahnemann discovered that by repeated triturations and succussions the power of the remedy was enhanced. These attenuations he called 'potencies'. Homœopathic remedies are not mere dilutions but potentizations.

**Homœousians**, the orthodox party in the Church during the great controversy upon the nature of Christ in the fourth century, who maintained that the nature of the Father and the Son is the same, in opposition to the *Homoiousians*, a sect of Arians, who held that their natures were only similar.

**Homoptera**. See *Hemiptera*.

**Homs**, a town of Syria, situated about midway between Damascus and Aleppo. It has always had a large trade, formerly by caravan road, now by railway. It has textile manufactures, and is noted for its gold and silver thread. Pop. 60,000.

**Honan**, an inland province of China, having an area of 67,940 sq. miles. It is generally level, and is watered by the Hwang Ho and its affluents. The soil is fertile and carefully cultivated; the forests in the west supply timber; and mines yield tutenag or Chinese copper, cinnabar, and mica. Pop. 22,375,000.

**Honawar**, a seaport and town of the subdivision of the same name, Bombay, on an estuary into which the Gersoppa River falls. It has an important and growing coasting trade. Pop. 7320.

**Hondo**. See *Honshu*.

**Honduras**, a Central American republic with a coastline of 400 miles on the Atlantic and 60 miles on the Pacific. It is bounded on the west by Guatemala, south by Salvador and the Pacific, east by Nicaragua, and north by the Atlantic. It has an area of 44,275 sq. miles, and a population of 770,000. Honduras is mountainous, richly timbered, and well watered (the main rivers are the Chamelicon, Ulua, and Choluteca). There are some extremely fertile valleys, and the Comayagua Plain is very productive. The capital is Tegucigalpa, the chief ports are Amapala (the only one on the Pacific), La Ceiba, Tela, and Trujillo, and the other towns are Choluteca and Juticalpa. The climate is hot on the coasts, but is elsewhere temperate and healthy. The mineral wealth of Honduras is almost unexploited. Much silver is found, and gold, coal, oil, and

lignite are worked, but on a very small scale. The chief product is the banana, while the coco-nut is also valuable. Coffee, maize, tobacco, and the sugar-cane are also grown, and vegetable oils form an important export. Excellent cattle are reared, and a certain amount of mahogany, cedar, and ebony is cut. In 1928, 24,000,000 branches of bananas and 8,000,000 coco-nuts were exported, the total value of exports being £4,628,547 and of imports £2,514,719. Roman Catholicism is the prevailing religion (though there is complete toleration), and education is free and compulsory. There is a university at Tegucigalpa. The language spoken is Spanish. Good roads are few, but gradual improvement is taking place, and there are 400 miles of railways. The republic declared its independence of Spain in 1821, and is at present governed by a Constitution approved in 1894. The executive authority is vested in the President and the Cabinet, while the legislature consists of one chamber.—**BIBLIOGRAPHY:** A. H. Keane, *Central and South America* (Stanford's Compendium); Pedro Rivas, *Dictionary of Honduras*; *The South American Handbook*.

**Honduras, Bay of**, a wide inlet of the Caribbean Sea, having on the south Guatemala and Honduras, and on the west British Honduras and Yucatan.

**Honduras, British**, a British Crown colony of Central America, bounded by Yucatan, Guatemala, and the Bay of Honduras. The area of 8598 sq. miles includes Albion Island and numerous *cayes* (islands) with a total area of 238 sq. miles. The coast is low and swampy, but the land rises toward the interior, being flat in the north and mountainous in the south. The climate is fairly healthy. There are numerous rivers which provide the principal means of transport. The chief are the Belize, Hondo, Sibun, and Sarstoon. There are extensive forests, and the staple products of the country are mahogany and logwood. Sugar-cane, coffee, bananas, coco-nuts, tobacco, &c., are cultivated. The principal exports are timber, bananas and other fruits, and tortoise-shell, the total value in 1928 being £831,584. In the same year imports amounted to £922,170. There are 25 miles of railway. The chief town is Belize, which, in September, 1931, was devastated, with great loss of life, by a terrible hurricane.

Honduras became known to Englishmen in 1638, but it was not till 1798 that Spanish opposition was finally quelled. In 1862 Honduras was made a colony subject to Jamaica, and in 1884 its independence was declared. — BIBLIOGRAPHY: A. B. Dillon, *Geography of British Honduras*; A. R. Gibbs, *History of British Honduras*.

**Hone**, the name given to several varieties of slaty stones employed in whetting knives, razors, or other edge-tools. The best-known varieties are the Ayr stone, so called from being found in the River Ayr, in Scotland; the Charnley Forest stone, found in Leicestershire; the German hone, the Canada oil-stone, and the Turkey oil-stone.

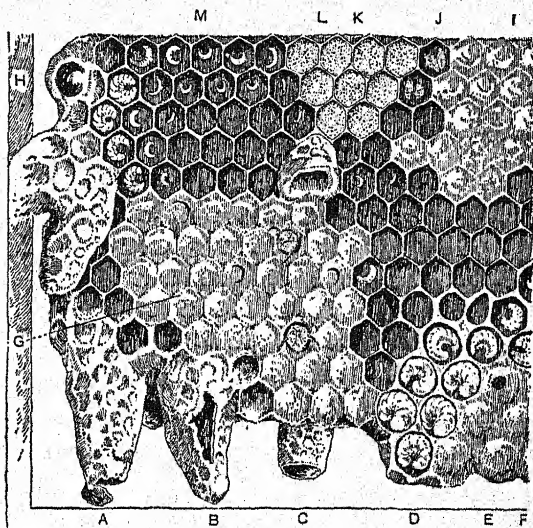
**Honey** is mainly a mixture of the sugars glucose, fructose, and cane-sugar. Spring honey is considered better than summer honey; and the latter than that of autumn. *Virgin* honey is honey which flows freely at an ordinary temperature from the uncapped combs. *Yellow* honey is extracted

from all sorts of combs. The flavour of honey largely depends on the plants from which it is collected. Honey was held in very high esteem and was valued by the ancients. It was used for sweetening purposes throughout the Mediterranean area until the introduction of sugar.

**Honey-ant**, an ant, species of *Myrmecocystus*, inhabiting the United States and Mexico, and living in communities in subterranean galleries. In summer one section is set aside to work while the other is fed extensively on a kind of honey from the oak-gall. Later when food is scarce these bankers of nourishment are eaten.

**Honey-comb**, a waxen cellular structure formed by bees for storage of honey and eggs. The wax is secreted by the insect in the form of small and thin oval scales in the folds of the abdomen. The comb is composed of a number of

cells, most of them exactly hexagonal, and arranged in two layers placed end to end,



Honey-comb

A, Queen cell from which queen has hatched. B, Queen cell torn open. C, Queen cell cut down. D, Drone grub. E, Drone cell partly sealed. F, Drone cell sealed. G, Worker cell sealed, bees biting their way out. H, Old queen cell. I, Sealed honey. J, Fresh pollen masses. K, Cells nearly filled with pollen. L, Aborted queen cell in face of comb. M, Eggs and larvae in various stages.

the openings of the layers being in opposite directions. The cells are closed by waxen lids after honey has been stored or eggs deposited in them. Queens are reared in irregular acorn-shaped queen-cells.

**Honey-dew**, a sweet saccharine substance deposited by aphides. Different kinds of manna are the dried honey-dew or saccharine exudations of certain plants.

**Honey-eater**, the name given to a number of perching Australian birds forming the family Meliphagide. They feed on fruit, buds, and the nectar of flowers. The wattled honey-eater, the soldier bird, and bell birds belong to the species.

**Honey-guide**, a name given to the cuckoos of the genera Indicator and Prodotiscus, which conduct persons to the nests of wild honey-bees. They are natives of South Africa and South Asia, and belong to the family Capitonidae.

Honeysuckle, or Woodbine, genus *Lonicera* of Linnaeus, nat. ord. Caprifoliaceæ. The common honeysuckle of Britain, *L. periclymenum*, a twining shrub, with distinct leaves and red berries, is indigenous in Great Britain, but two others have been naturalized. *Australian honeysuckle* is a name given to *Banksia australis* and other species of the Protea family, from their flowers being filled with a sweet liquid.

**Honfleur**, a seaport of France, department of Calvados, on the estuary of the Seine. It has a trade in agricultural and dairy produce, and some manufactures in connexion with shipping and fisheries. The harbour can accommodate vessels drawing 16 to 18 feet. Honfleur was long in possession of the English, and was of considerable strategical importance during the Hundred Years' War. Pop. 9298.

**Hong Kong**, an island off the south-eastern coast of China at the mouth of the Canton River. It is 11 miles long, has an area of 32 sq. miles, and is broken by abrupt ridges rising in Victoria Peak to a height of over 2000 feet. The narrow straits between the island and the mainland form a magnificent harbour on the south shores of which, and in terraces round the Peak, is the city of Victoria. The island is well watered, and, though once barren, is now covered with luxuriant vegetation. Hong Kong was ceded to Britain in 1841 and became a Crown colony. In 1860 the opposite peninsula of Kowloon (2½ sq. miles) on the mainland was ceded by the Chinese, and in 1898 a further area (356 sq. miles) including Deep Bay and Mirs Bay was leased to Britain for 99 years. The total area of the colony is 391 sq. miles, and the population is 662,200 (15,200 non-Chinese), of which 376,000 live on Hong Kong and 64,300 afloat. The chief industries are sugar-refining, ship-building and repairing, deep-sea fishing, and tobacco manufacture. There are several native industries, and much of the land in the leased territory is cultivated by Chinese. The island by reason of its position is a Chinese emigration and immigration depot, and is a trade distributing centre, the tonnage entered and cleared (excluding the coasting trade) being almost 30,000,000 tons per annum. The total value of the ocean trade (mainly in transit) of Hong Kong in a normal year is considerably over £150,000,000.

The Chinese tea and silk trades are largely in the hands of Hong Kong merchants, and other exports are antimony, bamboo, cassia, coir, ginger, wood and vegetable oils, rice, tobacco, and soy. There is an electric tramway and a cable tramway (up Victoria Peak) in Hong Kong, while in Kowloon there is the British section of the Canton Railway. Hong Kong is a military station, and is the head-quarters of the China Squadron. There is a university on the island.—**BIBLIOGRAPHY:** *Oxford Survey of the British Empire* (Vol. II); and various official reports.

**Honiton**, a town of England, in Devonshire, on the Otter, long celebrated for the manufacture of a special variety of lace. Pop. (1931), 3008.

**Honolulu**, the capital of the Hawaiian Islands, on the Island of Oahu. There is a fine natural harbour admitting the largest vessels afloat, and there are ample dry-dock and bunkering facilities. The exports are sugar, coffee, and fruit. Honolulu has a delightful climate, and is much visited by tourists. Pop. 83,327.

**Honorius**, Flavius (384–423), Emperor of the West, son of Theodosius the Great. After the division of the empire, A.D. 395, Honorius received the western half. The principal events of his reign were the adoption of rigorous measures against paganism in 399; the invasion by Alaric in 400–403; and another irruption of barbarians under Rhadagaisus, 405–406. Some of the finest provinces of the empire, Spain, Gaul, and Pannonia, were lost in this reign.

**Honshu** (sometimes *Hondo*), the largest of the Japanese islands, with an area (including 167 adjacent islets) of 87,426 sq. miles. It is about 800 miles long, and its shores are broken by innumerable bays, the chief of which are Tokyo, Mutsu, Ise, and Suruga. It is fairly mountainous especially in the centre, where are situated Fujiyama, the most perfect volcanic cone in the world, and Oshima, an active volcano. The mountains in the north belong to the Sakhalin system, and those of the south to the Korean system. The rivers are all short, and there are several lakes, the most notable being Biwa, which is sacred. The climate is somewhat warmer than that of Britain, rainfall is excessive, and earthquakes are frequent, and often, as in 1923, disastrous. There are numerous forests of oak, beech, maple, pine, cedar,



&c. Fruit trees are cultivated, and the island is renowned for its plum and cherry blossom. Gold, silver, copper, lead, and iron are mined; and fishing, sea and freshwater, is an important industry. The principal exports are rice, silk, tea, and various kinds of fancy goods and objets d'art. The capital is Tokyo, and the other chief towns and ports are Yokohama, Kyoto, Hiroshima, Kobe, Osaka, and Shimonoseki. Pop. (1925), 59,736,822.

Hoobly, a town of India, in Dharwar district, Bombay Presidency, a great centre of the cotton trade. Pop. 61,400.

Hooch, Pieter de (1629–? 1678), Dutch genre painter. He was peculiarly successful in depicting scenes, illuminated by sunlight, of Dutch domestic life. His earlier work is remarkable for its harmonious, rich colour, and puts him in the front rank of the smaller Dutch masters.

Hood, Robin, English outlaw and legendary hero. The earliest allusion to Robin Hood is to be found in *Passus V of Piers the Plowman* (B text), which was written about 1377. A large number of old ballads deal with the Robin Hood legend; most of these ballads date from the fifteenth century. There are three different theories advanced to explain the origin of the Robin Hood cycle of ballads: (1) Robin Hood was a real man, the greatest of outlaws. (2) Robin Hood is the central personage of a sun-myth, or is to be identified with the Teutonic god Woden. (3) Robin Hood was originally the name given to a mythical forest elf (cf. Robin Goodfellow), and then given, like the Irish Rory o' the Hills, as a generic name to any outlaw chief who lived in the forest and defied the unpopular game laws. The last of these three theories is the most probable. The Robin Hood cycle is very closely connected with Sherwood Forest and with Nottingham. Robin's company originally contained Little John, Much the miller's son, William Scathlock, and others; in the early sixteenth century Friar Tuck was added to the company, while a love-interest was supplied by Maid Marian. Robin Hood was essentially the hero of the yeoman class, as King Arthur was that of the upper classes. He was a typical middle-class Englishman, an unerring marksman, an expert with the quarter-staff, and he had a rough, boisterous sense of humour. Above all he defied the oppressive forest-laws, as every middle-

class Englishman wished to do.—BIBLIOGRAPHY: J. Hunter, *Great Hero of the Ancient Minstrelsy of England*, *Robin Hood*; F. J. Child, *English and Scottish Popular Ballads*.

Hood, Samuel Hood, first Viscount (1724–1816), British admiral. He saved the Island of St. Christophers from being taken by de Grasse, and assisted in the defeat of de Grasse by Rodney in 1782. In 1793 he commanded against the French in the Mediterranean, and captured Toulon and Corsica.

Hood, Sir Samuel (1762–1814), British admiral, cousin of the above. He captured Tobago and the Dutch settlements in Guiana, 1803; and defeated the French squadron off Rochefort in 1806.

Hood, Thomas (1799–1845), British poet and humorist. In 1821 he became sub-editor of *The London Magazine*, and in 1826 appeared his *Whims and Oddities*. From 1829 to 1837 he conducted *The Comic Annual*. In 1837, on the termination of *The Comic Annual*, he commenced a monthly periodical entitled *Hood's Own*. His health now began to fail, and with a view to its recovery he paid a visit to the Continent. While there in 1839 he published his *Up the Rhine*. Shortly after his return he undertook the editorship of *The New Monthly Magazine*, and continued it till 1843. His last periodical, entitled *Hood's Magazine*, was commenced in 1844; but his health shortly afterwards completely broke down. It was during his last illness that he contributed to *Punch*, *The Song of a Shirt*, *The Bridge of Sighs*, and *The Lay of a Labourer*. Hood is unrivalled as a punster, and he possesses a singular power of combining the humorous with the pathetic.—Cf. Walter Jerrold, *Thomas Hood: his Life and Times*.

Hood, Tom (1835–1874), British humorist, son of Thomas Hood. In 1861 appeared his *Daughters of King Daker*, and other *Poems*. In 1865 he became editor of *Fun*.

Hooded Seal (*Cystophora cristata*), a species of seal, the male of which possesses a movable, inflatable muscular bag, stretching from the muzzle to about 5 inches behind the eyes. The prevailing colour is dark-grey.

Hooghly, the most westerly arm of the Ganges delta, India. It is formed about 55 miles above Calcutta and is 15 miles wide at its mouth. It is tidal as far as



Calcutta, to which city ships drawing 26 feet ascend.

**Hooghly**, a district and town in Bengal, India, 22 m. north of Calcutta. The district has an area of 1188 sq. miles, and exports rice, cotton, cloth, and gunny bags. Pop. (district), 1,090,000; (town), 30,000.

**Hook**, Theodore Edward (1788–1841), English novelist and journalist. From 1820 to 1841 he was editor of *John Bull*, and at intervals from 1824 to 1828 he published his *Sayings and Doings*, while in 1836 he became editor of *The New Monthly Magazine*. His other principal works are *Life of Sir David Baird*, and a series of novels, among which may be mentioned: *Love and Pride*, *Jack Brag*, *Gilbert Gurney*, *Gurney Married*, *Precepts and Practice*, and *Fathers and Sons*.—Cf. R. H. D. Barham, *Life and Remains of Hook*.

**Hooke**, Robert (1635–1703), English mathematician and natural philosopher. He is chiefly known as the discoverer of *Hooke's Law*, which he stated in the form "Ut tensio sic vis"; the meaning being that in elastic bodies stress is proportional to strain. He was a prominent member of the Royal Society in its early days.

**Hooker**, Sir Joseph Dalton (1817–1911), British scientist. In 1839 he accompanied Sir James Ross's Antarctic expedition in the *Erebus*, and published an account of the flora of the sub-Antarctic and south temperate regions. He led a botanical expedition to North India in 1848. He was appointed assistant director of Kew Gardens in 1855, and succeeded his father as director in 1858. His works include *Genera Plantarum*, *Flora of the British Isles*, and *Himalayan Journals*.

**Hooker**, Richard (1553–1600), English ecclesiastical historian. His *Ecclesiastical Polity*, published at various dates, and written in defence of the Church of England, is no less remarkable for learning and extent of research than for the richness and purity of its style, which entitles its author to be regarded as one of the classics of the Elizabethan age.—Cf. Izaak Walton, *Life of Richard Hooker*.

**Hooker**, Sir William Jackson (1785–1865), British botanist. From 1821 to 1841 he was professor of botany at Glasgow University, and he became director of Kew Gardens in 1841. He wrote, among other works, *The British Jungermanniæ*, *Icones*

*Plantarum*, and *A Century of Orchidaceous Plants*.

**Hook of Holland**, a point and village in the Netherlands at the entrance to the Nieuwe Waterweg which connects the North Sea and Rotterdam. Passengers from Harwich disembark here and entrain for all parts of Holland and Germany.

**Hoop-ash** (*Celtis crassifolia*), an American tree of the order Urticaceæ, found in Ohio and in the Western States.

**Hooper**, John (c. 1495–1555), English reformer. In 1550 he was nominated Bishop of Gloucester. On the accession of Queen Mary, in 1553, Hooper was deprived and imprisoned, and in 1555 burnt at Gloucester.

**Hoopoe**, a bird forming the type of a family (Upupidæ) related to the hornbills. The European species (*Upupa epops*) is many-coloured, with a black-tipped crest, and feeds largely on insects.



Hoopoe (*Upupa epops*)

**Hoorn**, a seaport of Holland, on a small bay of the Zuider Zee, 20 miles N.N.E. of Amsterdam. The trade is extensive, especially in dairy produce. Pop. 11,244.

**Hoorn Islands**. See *Futuna*.

**Hoover**, Herbert Clark (1874– ), President of the United States of America since 1929. He was Food Administrator for the U.S.A., 1917–19; and Secretary of Commerce, 1921–28.

**Hop** (*Humulus Lupulus*), a plant of the nat. ord. Moraceæ, a native of Europe, and perhaps of the United States, where

it occurs wild. The root is perennial, giving out several herbaceous, rough, twining stems, with large lobed leaves; the fertile flowers are green; the fruit is a catkin, and the plant is cultivated for the sake of the catkins, which are employed to communicate to beer its aromatic bitter flavour. The young shoots are sometimes boiled and eaten like asparagus; the fibres of the old stems make good cords. The use of the hop catkins depends upon a peculiar bitter substance called *lupulin* (q.v.).

Hope, Anthony, pseudonym of Sir Anthony Hope Hawkins (1863– ), British novelist. He became generally known only after the publication of his *Dolly Dialogues* (1894). *The Prisoner of Zenda*, his first romantic novel (1894), met with an immediate success. Other works are: *The Chronicles of Count Antonio* (1895), *Rupert of Hentzau* (1898), *Simon Dale* (1898), *Quisante* (1900), *Mrs. Mazon Protests* (1911), *A Young Man's Year* (1915), and *Beaumaroy Home from the Wars* (1919). He was knighted in 1918.

Hope, Thomas (1770–1831), English writer. His principal works are: *The Costume of the Ancients*, and *Anastasius, or Memoirs of a Modern Greek*, a novel displaying remarkable descriptive powers and a minute accuracy in the accounts of Eastern life.

Hop-fly (*Phorodon humuli*), a species of plant-louse very destructive to the hop. The winged female is green, with a black head and bands and spots of black on the body; the legs and wings are long.

Hoppner, John (1758–1810), English painter. He painted most of the prominent men and women of the day, especially those in the circle of the Prince of Wales.

Horace (Quintus Horatius Flaccus) (65 B.C.–8 B.C.), Roman poet. He was educated at the best school in Rome, and at the University of Athens. After the murder of Julius Caesar, he joined the army of Brutus, was present at the battle of Philippi, and took part in the general flight of the Republican forces. He returned to Italy to find his property confiscated. He managed to scrape together enough money to purchase for himself an underclerkship in the Civil Service, and by strict economy was able to live on his salary. He eked out his livelihood by means of writing verses, and he made

the acquaintance of other poets and literary men, among whom were Virgil and Varius. In 38 B.C. they introduced him to Mæcenas, the minister of Augustus, who became his life-long friend and patron. Mæcenas presented Horace with a Sabine farm, which made the poet able to leave his Civil Service appointment. Meanwhile he was slowly producing poems of various kinds. The first book of his *Satires*, ten in number, appeared in 35 B.C. In some of these Horace shows himself somewhat immature. A collection of poems in iambic and composite metres, known to us as the *Epodes*, was published about 30 B.C. These poems, which follow Archilochus, the Greek satirist, as a model, are not pleasing. Horace developed late, and it was not until the publication of the second book of his *Satires* (29 B.C.) that he attained maturity. The advance on the first book is most striking; Horace shows himself as a polished man of the world, a master of quiet humour, and a great literary stylist. His mastery over metre is no less remarkable; he has as perfect command over the satirical hexameter as Virgil has over the stately heroic hexameter. In 19 B.C. Horace produced what may be considered his greatest work, the first three books of his *Odes*. These poems are perhaps as well known as any poems in the world; almost every line of them has become proverbial. It is easy to criticize them; it is plain that Horace has not got the fire of Shelley or Catullus, and that there was no 'unpremeditated art' about him. His love poems do not ring true. Some of them may be simply translations from the Greek. Yet the value of the *Odes* is great. For choice language and for clothing commonplace thought in an unforgettable form they are unequalled. Horace is the poet of those who do not as a rule love poetry; he is a matchless master of language; he is a skilful adapter of Greek metres. In some of his Roman odes he is even more than this; his love for Rome was much deeper than his love for Chloë, and there is no loftier patriotic poetry in the world than the opening odes of the third book. Soon after the publication of the *Odes* Horace published the first book of his *Epistles*, where we see the wise author of the *Satires* mellowed by the passage of time. The fourth book of the *Odes*, published probably in 12 B.C., may be regarded

as a semi-official publication, some of the poems celebrating the victories gained by Drusus and Tiberius. The second book of *Epistles*, consisting of two only, deals mainly with literary criticism, as does the *Epistula ad Pisones*, usually known as the *Ars Poetica*. Horace is one of the best loved of all authors. His popularity is partly due to his exquisite choice of language, that which Petronius called "Horati curiosa felicitas", and which makes him the most quotable of authors. It is, however, due more to those qualities which make him the most companionable of poets—it is due to his *Satires* and *Epistles* even more than to his *Odes*. We cannot always be on the heights with Æschylus and Dante and Shakespeare. Horace is the poet of the workaday world, the greatest of all the second class of poets. No other poet who is so essentially national and 'of an age' has managed also to become 'for all time'.—BIBLIOGRAPHY: W. Y. Sellar, *Horace and the Elegiac Poets*; A. Y. Campbell, *Horace: a New Interpretation*. The best complete translation is that by J. Conington; C. S. Calverley has translated some few odes in his own inimitable way.

**Horæ**, in classical mythology, the goddesses of the seasons and the order of nature. Their number was usually said to be three, and their names Thallo, Carpo, and Auxo.

**Horatii**, three Roman brothers, who, according to tradition, fought with three Alban brothers (the Curiatii). The three Curiatii and two of the Horatii were killed, and the survivor was triumphantly conducted back to the city. But his sister had been betrothed to one of the Curiatii, and her demonstrative grief so enraged Horatius that he stabbed her.

**Horatius Cocles**, a hero of ancient Rome. According to tradition, Horatius Cocles, along with two companions, held the Sublician bridge against the Etruscans, while the Romans broke it down behind them. When this was nearly finished, he sent back his two companions, and as the bridge fell he plunged into the Tiber with his armour and safely reached the opposite bank.

**Horbury**, a town of England, West Riding of Yorkshire, 8 miles south-west of Wakefield, with manufactures of woollen goods. Pop. (1931), 7791.

**Hordaland**, a fylke of Norway, area

5991 sq. miles, pop. 156,218. The chief town is Bergen.

**Hörde**, a town of Germany, in Westphalia, on the Emscher, a centre of the iron manufacture, and having large coal-mines. Pop. 29,000.

**Horehound** (*Marrubium vulgare*), a labiate plant, with whitish leaves and small pale flowers, found in Europe. Black horehound (*Balota nigra*) is an unattractive plant.

**Horizon**, in ordinary speech the line where earth and sky seem to meet, or the circle which bounds that part of the earth's surface visible to a spectator from a given point. This is termed the *sensible*, *visible*, or *apparent horizon*, as distinguished from the *rational* or *true horizon*, an imaginary great circle, parallel to the sensible horizon, whose plane passes through the earth's centre, whose poles are the zenith and the nadir, and which divides the celestial sphere into upper and lower hemispheres.

**Hormones**. See *Glands*; *Ovary*.

**Horn**, **Hoorne**, or **Hornes**, Philip, Count van (1518–1568), Flemish soldier and statesman. He fought at St. Quentin in 1557, and Gravelines in 1558, and in 1559 accompanied Philip to Spain. On his return he joined the Prince of Orange and Egmont in resistance to Philip. On the arrival of Alva at Brussels he was arrested on a charge of high treason, and he and Egmont were beheaded.

**Horn** is a tough, flexible, semi-transparent substance, most liberally developed in the horns of bovine animals, but also found in connexion with the 'shell' of the tortoise, the nails, claws, and hoofs of animals, the beak of bird and turtle, &c. True horn consists principally of an albuminoid substance, *keratin*, with a little gelatine and phosphate of lime. In some species of animals the males only have horns, as for instance the stag. In cattle both male and female have horns, though there are also hornless or polled cattle. Horns differ widely in the case of different animals. Thus the antlers of deer consist of bone, and are deciduous; those of the giraffe are independent bones, with a covering of hairy skin; those of oxen, sheep, and antelopes consist of a bony core covered by a horny sheath. The horns of the rhinoceros alone consist exclusively of horny matter. The horns of oxen, sheep, goats, and antelopes are never shed, except in the case of the prong-horned antelope.



The number never normally exceeds four, and in the case of deer the antlers are usually branched.

**Horn**, French, or simply *the horn*, consists of a metallic tube of about 10 feet in length, very narrow at top, bent into rings, and gradually widening towards the end whence the sound issues, called the *bell*. It is blown through a cup-shaped mouthpiece of brass or silver, and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the bell of the instrument. The compass of the instrument is three octaves.

**Hornbeam** (*Carpinus Betulus*, nat. ord. Cupulifere), a small bushy tree common in Britain, and often used in hedges. The wood is used in turnery, and the inner bark yields a yellow dye. There is an American species.

**Hornbills**, a remarkable family of birds (Bucerotidæ), akin to the kingfishers and

is plastered up in the hollow of a tree and fed by the male through a small aperture left for the purpose.

**Hornblende**, the typical member of the *amphiboles*, one of the most abundant and widely diffused groups of minerals, occurring principally in igneous rocks. In colour hornblende is usually black or greenish-black; it is nearly transparent in some varieties, but is commonly opaque; hardness a little less than that of felspar; specific gravity about 3.0. It is an aluminous magnesium iron silicate, with some calcium, and often arises from slow processes of change in augite, the corresponding pyroxene. Hornblende containing sodium connects this mineral with the blue species *glauco-phane* and *riebeckite*.

**Hornbook**, in former times the first book of children, or that in which they learned their letters: so called from the transparent horn covering placed over the single page of which it usually consisted, the whole being fixed to a wooden frame with a handle. It generally contained the alphabet in Roman and small letters, several rows of monosyllables, and the Lord's Prayer. The first hornbook was made about 1450.

**Horncastle**, a town of England, county of Lincoln. It has a considerable trade in corn and wool, and one of the largest horse-fairs in the United Kingdom is held annually in August. Pop. (1931), 3496.

**Horne**, Henry Sinclair Horne, Baron (1861-1929), British soldier. When the European War broke out, he went to the front as commander of an artillery brigade, was in Gallipoli and Egypt, where he defended the Suez Canal, and in 1916 commanded the 1st Army.

**Horne**, Richard Hengist (1803-1884), English poet, dramatist, and miscellaneous writer. In 1844 *A New Spirit of the Age*, a critical work in which he was assisted by Miss Barrett (Mrs. Browning) and Robert Bell, appeared. Of his many writings, the best known are *Orion* (published at one farthing in 1843), and *The Death of Marlowe*.

**Horne**, Sir Robert Stevenson (1871- ), British lawyer and politician. He became Assistant Inspector-General of Transportation in 1917, and was transferred to the Admiralty, where he became Director of the Labour Department and subsequently Third Civil Lord. He was Minister of Labour (1919-1920), Presi-



Crested Hornbill (*Bycanistes cristatus*)

the hoopoes, remarkable for the size of the bill, and for an extraordinary horny protuberance by which it is surmounted. The rhinoceros hornbill (*Buceros rhinoceros*), native to the Malay Peninsula and Indo-Malay islands, is a big black bird with white markings. It has a great long, slightly-hooked bill with an immense appendage. During incubation the female